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NORTHERN NEW GUINEA, 1936: *A paper read at the Evening Meeting of the Society on 22 March 1937, by*

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EXCLUDING Greenland, New Guinea is the largest island in the world. Some 1400 miles in length, the country has been cut roughly in half by the international boundary between Dutch New Guinea on the west and Papua and the Mandated Territory on the east. In the interior there is some of the least-known country in the world. Much haphazard though extremely valuable data have been obtained by government patrols and prospecting parties in the Mandated Territory and Papua, but it would seem that very little detailed information concerning the interior and its peoples is readily available. The great work of Karius and Champion, and of the Leahy brothers, and the popular accounts of journeys by C. A. W. Monckton and J. G. Hides are well known. Some of the best scientific exploration has been the work of the field officers of a commercial organization, Oil Search, Ltd., under government permit in the Mandated Territory. This work is being carried out between the great Sepik River and the north coast, and some of the results are now incorporated in official maps issued by the administration. Most of the interior ranges and plateaux however have yet to be explored by the white man.

Dutch military expeditions have surveyed almost every navigable river in Netherland territory, but seem to have made practically no land expeditions to supplement their extraordinarily thorough water surveys. One of the best expeditions in Dutch New Guinea was led by A. F. R. Wollaston into the Snow Mountains in 1912. Several volumes dealing with the fauna, flora, and other aspects of the country have been published by the Dutch New Guinea Committee, and recently a party of American biologists, assisted by a Fairchild amphibian, have collected in sub-central regions in Papua. But up to the present no expedition appears to have made a comprehensive study of any of the Stone Age tribes which still, without knowledge of European culture, inhabit the central ranges; extremely few peaks have been scaled, and no extensive faunal collections have been made on the central uplands.

Whilst members of the Oxford University Expedition to the New Hebrides in 1934, T. H. Harrisson [1] and I decided to attempt the organization of an expedition to central New Guinea. It fell to me to undertake the preliminary reconnaissance, which we both felt was necessary to the enterprise into which it was hoped that the project would develop. On the reconnaissance trip all three territories were visited, and during the eleven months that I spent in the country, three journeys of importance were made. On these expeditions considerable ethnological and zoological collections were made for the Australian Museum, Sydney, and the chief object of the preliminary reconnaissance fulfilled, namely, to gain sufficient data and first-hand experience in the country to ensure the efficient organization of the important expedition to follow in 1938–39. During my work I was at all times materially assisted by my friend and companion Mr. W. J. Hook, of Aitape. Officers of the administrative services of the territories in which I worked were also most helpful.

Journey to Anguganak sandstone barrier

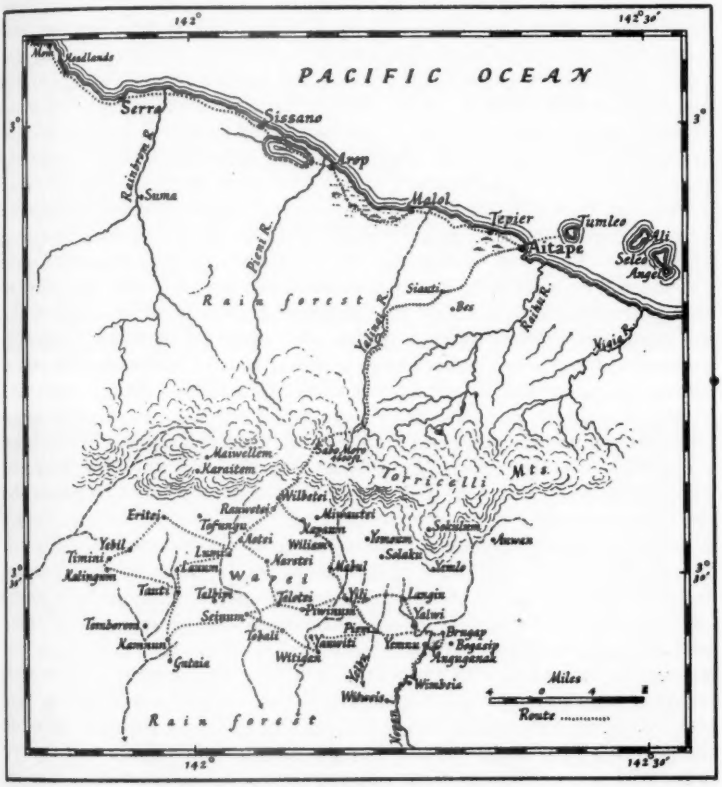
A glance at the accompanying map shows Anguganak as a village some 35 miles inland from Aitape on the north coast of the island. The journey now to be described occupied exactly one month.

The initial route lay through the stricken Torricelli Mountains. In September 1935, four months before my arrival, this range was shattered by an earthquake, which caused great damage and threw the seismograph out of action at the Riverview Observatory at Sydney, nearly 2000 miles away. The beaches for 100 miles each side of the damaged ranges are still littered with the debris carried out to sea by the floods which followed the disaster. The coastal lowlands are heavily wooded with dense rain forest, intersected by shallow swift-running freshwater streams flowing out of the ranges. The road towards the mountains is a bush track winding through the humid jungle, and is the worst in my experience. Almost every foot of the way is deep swampy ooze, carelessly covered in the past by softwood corduroy which fairly soon rots. The natives whose territories adjoin the track are naturally averse from doing any labour not essential for their material welfare, and make no voluntary effort to repair the road even in the immediate vicinity of their villages. Spasmodic (perhaps annual) visits by government officials are not sufficiently frequent to ensure that their orders in regard to road maintenance are obeyed. So it remains in an appalling condition, and every slushy mile seems like a dozen.

At the Yalingi River, rising in the Torricelli Ranges, there is more evidence of the catastrophe. In the disaster, great piles of debris had crashed into the valleys, creating brimming dams which had finally burst, loosing a torrent of pent-up floodwater which had flowed into the lowlands, menacing the property and lives of the river natives. We saw huge piles of torn timber, stripped logs half-buried at muddy river bends, hundreds of acres of wrecked jungle along the banks. In places the floor of the forest is buried in five or six feet of silt, and the trees which remain erect are sadly battered and stripped of

[1] "Living in Espiritu Santo," by T. H. Harrisson, a paper in which some of our joint work is described. *Geogr. J.* 88 (1936) 243–61.

every vestige of foliage. The former green tropic jungle resembled an English wood in winter, badly battered. Knife-marks, careless shoulder-high slashes of passing natives, now appear at ground level or are buried below. The track over the mountains, a traditional trading route of the Wapei natives, was almost completely destroyed. Hillsides had slid away, carrying with them millions of tons of earth and timber, revealing bare rocky ridges completely devoid of vegetation. As the line of carriers climbed higher into the



North-east New Guinea

ranges we saw where ridge after ridge had crashed into the valleys. Great slices, hundreds of acres in extent, had been shaken out of the heavily timbered mountains. The ruined valleys below presented an awe-inspiring spectacle; fortunately the mountains are uninhabited.

Coincident with the cloud-belt beginning at about 3000 feet the vegetation changes in character, and one enters a more open type of moss-hung forest, whilst the spongy moss underfoot is saturated with moisture. The trees are continually dripping with water, birds are comparatively scarce, and animal

life generally is not nearly as obvious as in the warmer, humid lowlands. Gaunt trees, mosses of infinite variety, fungi, pitcher-plants, orchids and many kinds of tree-clinging plants are the dominant vegetation, creating a picturesque forest which closely resembles those of north-east Australia and the New Hebrides at similar altitudes.

At Sabo Moro, the point of crossing, the range is 4600 feet in height. There is a fragile native-built rest-house nearby, which miraculously escaped destruction in the earthquake, and from this locality, as the drifting mists momentarily clear, magnificent views of the coastal forests, lagoons, and islands are obtained. On a clear morning, once the crossing is made, one sees hundreds of square miles of green jungle descending undulating towards the south, ending in the yellowing tracts of ***kunai*** (or allied) grass skirting the swampy banks of the Sepik River. These tangled foothill forests are densely populated. After days in the depopulated Western Pacific it was grand to gaze over country inhabited by thousands of healthy, virile people. The "big-name" or district name of this country is Wapei, and its dwellers are peaceful traders, though they fight with a normal and healthy frequency among themselves. They are dark-brown, medium-sized people who have been "civilized," *i.e.* visited by Europeans, for ten years past, and have already unhappily discarded many of the customs of their ancestors. Before the advent of the white recruiter (a person who under government supervision persuades strong young natives to go to work) and the administration patrol officer, the males wore simply a pubic shell, or a seed-pod (from a tree) converted to a similar purpose. Some wore a belt of bones: the curious semi-circular vertebrae of a jungle snake. Nowadays most of the younger men wear calico, once brightly coloured, but after a few weeks becoming a revolting rag, filthy with sweat and dirt. The Wapei people have wholly discarded the stone implements of their ancestors and rely largely on white man's steel: one of the greatest factors in the cultural decay of the Melanesian. Although the adventurous Wapeis have always traded with the more sophisticated coastal people and have been aware of the white man for many years, it is only since they have gone to work under indenture on the plantations and gold-fields that cultural decadence has been intensified. The native is imitative and acquisitive; he returns with a profound belief in the superiority of European methods—and usually with an umbrella, nondescript clothing and his hair bleached white with peroxide of hydrogen! All this is perhaps excellent for the purposes of white enterprise, but for the ultimate welfare and culture of the tribe it is deleterious in the extreme. It would seem inevitable that the old régime must pass; the clash of cultures proceeds, and always to the detriment of the black man. The New Guinea native is fortunate only in that he is governed under a mandate which has rightly shown great regard for his welfare.

The Wapeis build their villages along the ridges, sometimes excavating holes in the sandstone, into which they place the corner posts of their dwellings. The houses are made principally of bamboo and thatched with the broad foliage of the sago palm. Often the trunks of tree-ferns are used for the corner posts. The villages are frequently barricaded by tall palisades of bamboo-trunks, and in almost every instance are reached only after a stiff climb. As

Jungle village in the Aitape hinterland

Bamboo stockade of a Wapei village

Earthquake damage on the Torricelli range

Earthquake fissure in the Torricelli mountains

everywhere else, the tracks mainly run along the ridges, though frequently dipping down into the valleys to cross a clear mountain stream before another steep pull up to the next village. The typical ridge vegetation is bamboo, of at least two species, giving way to a bewildering variety of flora in the valleys. The people make considerable use of bamboo. It serves them to make houses, pipes, flutes, personal ornaments, water-containers, cooking utensils, and a dozen other articles of general use in the community.

In Wapei many lives were lost in the earthquake. The villages on the ridges were all badly shaken, and houses and people were often carried away when the hillsides slipped into the valleys. Everywhere I saw signs of industry on the part of the inhabitants, the rebuilding of burnt or fallen houses, and the occasional re-establishment of unsafe or abandoned villages on neighbouring ridges. At Yili, on the southern boundary of the district, the *house-tambaran*, or "devil-house," had been shattered, and the main site of the village removed to another ridge. A large fissure ran through the middle of this ceremonial building, the most important in the community, pigmented tapestries of coconut fibre had been ripped asunder, and the whole building was in a state of wild disarray. Apparently the Yili folk regarded the disaster as the work of some supernatural element utterly beyond their comprehension; they had made no attempt to renovate or rebuild the wrecked house-tambaran.

The remainder of the houses however had been speedily replaced by new buildings on an adjacent ridge. Among the new houses was a tall thatched structure somewhat reminiscent of a pigeon-box in comparison with the others. It stood twice as high, being about 20 feet by 20 feet and some 25 feet from floor to roof with a side door screened, about 15 feet high. For miles, approaching the village, we had been aware of the rolling drumming of the hollow-log *garamut* drums, and as we drew nearer the high-pitched music of the pig- and lizard-skin *kundu* drums was heard. The Yili people are friendly folk, and even allowed me to approach the tall house from whence came chanting voices and the ceremonial music we had previously heard. Suddenly from the high door emerged two giant figures, each about 15 feet tall, armless and headless, of utterly inhuman form. They commenced to career around the village square to the thunder of drums and chanting of voices from the tall house. The figures were decorated with the lovely plumes of the bird-of-paradise, the fluffy tails of flying squirrel (marsupial glider) and cuscus, cockatoo crests, shell-money, coloured flags, and rushes gathered from the river. The legs, the only part even remotely resembling a human being, were swathed in coconut cloth and were of elephantine proportions. The weird figures lumbered around the square in wild abandon, whirling past groups of uneasy females in the house doors. After several frenzied turns of the square they retreated to the tall house, and the music at once died to a rumble and finally ceased. After frequent repetition of the dance I approached, and after some discussion was allowed to enter the house.

Men is the name they gave this particular "sing-sing," or ceremony, and it was celebrated to commemorate the healing of an awful wound on the ankle of Yilel, an important villager who crouched by the drums and later obligingly removed a filthy rag to show me the site of his affliction. The women's uneasiness was due to the secrecy and mystery of the proceedings, for they

were totally unaware of the presence of the human element in the dance, and were under the delusion that the giant dancers had simply "come up nothing" in order to commemorate the healing of Yilel. All this was told me in a hoarse whisper of pidgin-English, as though my informants were afraid of listening females outside. The one or two half-grown boys who were present with the painted drummers had apparently reached the age of discretion, for they were in complete possession of the secrets, and were near me when I saw a sweating native crawl from beneath one of the great masks after a paroxysm of "dancing." Death, they said, would automatically fall on any person who divulged secrets of the "sing-sing" to the women. After a week's continuous day-dancing the masks would be dismantled and the component parts of fibre, fur, feathers, and shell stored away until later required.

The route now led roughly south, crossing the Yelbu river and reaching Nuki village, battered and now deserted. We found a new place in the course of construction on a lower and safer ridge. The new Nuki was built in an area carved from a tract of virgin bamboo forest. These people speak a different dialect from the Wapeis whose territory we had just left, but most of the villagers were able to "turn the talk," *i.e.* convey ideas to, and partially understand, people of the last district. Here the people seemed more attractive physically, and steel is noticeably less common. Further in, towards the coastal ranges, game is scarce, and the Wapeis find it extremely difficult to secure meat from the jungle. Cassowary, wallaby, tree-kangaroo, and wild pig, though plentiful in the coastal scrubs and equally common in the country into which we were heading, are luxuries indeed in the heavily populated Wapei district. Perhaps this normal abundance of meat protein is responsible for the more attractive physique of the people whom we met "down below"; possibly, on the other hand, it is because they are remote from European influence and have, generally speaking, not yet donned the calico which seems to rob them of inches in height and transform them from proud unfettered savages to miserable semi-sophisticated hirelings of the white master.

From Nuki we travelled to Yankok; we were now only about 1100 feet above sea-level. Even at this low altitude it was unnecessary to use a mosquito net, for the *Anopheles* mosquito was apparently unknown. Other insect pests however made their presence felt: wasps stung the toiling carriers, swarms of flying ants invaded the camps at night, and myriads of sticky bees, attracted by salt perspiration and the coarse salt which was carried as trade, inundated every camp and made themselves the supreme nuisance of the journey.

The further we left the coast behind the less clothes and steel implements appeared among the people. The Brugap people possessed little calico indeed, and we saw few steel knives; but although they were camera-shy, they brought an abundance of food in return for salt, razor-blades, and bright-hued rings which we traded. There was never difficulty in securing food: always the graceful young women, and a sprinkling of withered old hags, appeared in the afternoons loaded with sago, yams, taro, sweet potato, and native vegetables to trade. Guides were readily available at every village, and the only suspicion of hostility encountered was when a carrier limped

up with a bleeding foot which had been pierced by a sharpened bamboo sliver, placed obliquely in a forbidden bypath. He got medical treatment, but no sympathy. He had paid for his curiosity and disobedience of orders against wandering into village precincts which did not concern him; but as the natives do not poison their weapons, the incident was of no great importance.

The Bogasip people were the first natives encountered who seemed almost totally uninfluenced by the European. They still wear a fantastic head-dress of fur and feathers, carry bone daggers, and steel is practically unknown to them. Although they had little knowledge of white men, they had apparently heard of their insatiable desire to possess fine feathers, for they brought up beautiful bird-plumes for inspection and trade almost immediately. I was somewhat puzzled at first, but it soon became apparent that these people had heard tales of the plume-trading days when white men paid Malays and natives to shoot birds of paradise in the hinterland. Long before the first European ventured over the Torricelli Ranges the Malay bird-shooters knew the country, and had established friendly trading relations with the Wapeis, travelling all the way from Dutch New Guinea in quest of the precious plumes which realized as much as five pounds per bird. A Papuan Government party, some 300 miles up the Fly river, found natives used to Malay bird-shooters. So it was that we, too, found primitive stone-age natives aware of the white man's craving for beautiful feathers. Unfortunately they were a decade out of date, for it is many years since the bottom dropped out of the plume trade, and even the most radiant feathers became valueless. At Nuki two of the young female food-bearers were extremely pale, and had an almost Eastern slant in their eyes. Later I saw other examples of this phenomenon in localities even further inland. It appears to be due to Malayan influence; to bird-hunters who travelled and even lived temporarily in remote areas during the hey-day of the plume trade. In the country a little further west the natives are still able to speak a few words of Malay pidgin, a heritage of the old hunters from beyond the border.

The original intention had been to secure guides at Bogasip or Brugap to guide us first to Yemnu, a village near the Nopan river beneath the great sandstone barrier of Anguganak. But a dispute was on; both villages were at enmity with Yemnu, and it was diplomatic, in fact necessary, to climb to the barrier community first. The New Guinea traveller will continually find his proposed itinerary modified by like circumstances completely beyond his control. A wise man will always be guided by native information, taking into account, if possible, happenings of this nature. More than one white man has found trouble by taking guides or recruits through a village which was at war with the community to which they belonged.

The Nopan, or Laupan, river rises in the Torricelli Mountains, and is joined by many lesser streams before it curves past the great Anguganak barrier on its way to join the Sepik. Ever since the great earthquake all these rivers have run yellow with mud, and at the time of our penetration heavy rain in the ranges had rendered the water muddier than ever, and the river ran deep and swift. At intervals the dense green of the jungle was brightened by the sprawling masses of scarlet flame-flowers of the *D'Albertis* creeper

which overhung the banks. From eminences on the ridges one could see miles of green, bejewelled with red patches: the autumn leaves of a species of tree which I could not name. In the damp rain-forest grew beautiful orchids, and in the rocky creek-beds wild balsam flourished in the mossy crevices. Wasps stung the carriers and myself; I was amused to note that the natives shrieked and ran like children from the insects, even though they were accustomed to bearing stoically the deliberate and agonizing tribal markings inflicted on their arms and bodies.

The 1000-foot ascent of the sandstone barrier is particularly severe. Foot and hand holes have been cut or worn in the soft stone cliff face. Several hundred feet are negotiated by climbing up a dangerous ladder-work of moss-grown roots, gnarled and worn in places by generations of dusky feet. A slip would pitch the climber into the jungle tree-tops far below. A single man could hold the track against an army. As usual, the path along the summit to the village ran within inches of the cliff-edge. There is apparently no tribal name for the people of this region. They occupy a strip of country below Wapei, and bounded on the south (they told us) by a wilder people who inhabit the grasslands bordering the Sepik River and who wear a pubic adornment in the form of a drilled gourd into which the penis is thrust. We did not penetrate sufficiently deep to meet this tribe, but were able to spend some days in the country inhabited by the natives about to be described.

They are a fine upstanding people, who hunt and fight with bows and arrows, and long barbed spears, which they hurl with great accuracy. They use stabbing daggers of yellowed bone from the femur of the cassowary. Next to the pig, which provides them with food and skin for their musical *kundu* drums, the cassowary is probably the most important animal in their economy. It furnishes them with food, wing-spines for nasal ornaments, bone for weapons, and bristle-like plumes for the all-important head-dress. The elaborate head-dress is fitted over a specially trained backwardly directed tuft of hair. It is as thick as one's wrist and several inches long, and upon it rests a fur and feather creation of considerable beauty and complexity. Sometimes the smooth, black wing membrane of the fruit-bat or flying-fox (*Pteropus*) is stretched across the forehead, surmounted by circles of black fibrous material and tiaras of *tambu* or "money-shell." (These are flat, ground, perforated discs of a special sea-shell, which by devious trading routes finally reaches the hinterland people who have never seen the sea from whence their decorations originally came.) The shell is alternated with circular tufts of cassowary plumes, which in turn give way to a curious woven basket-like tube which is fitted over the hair-tuft. To the woven tube is attached bird of paradise plumes, the sulphur-coloured crests of cockatoos, decorative cocoons of insects and freshly plucked red and yellow flag-leaves which hang down the back. Short lengths of bamboo, tufted white or cinnamon with the fur of the cuscus, are thrust through perforated ear-lobes. With spines through their noses, teeth-necklaces about their throats, and armlets of plaited grass holding flowers and colourful croton leaves, these people create a striking impression of splendid savagery.

The young male piccaninnies and the old men were naked. The virile males wore simply a brief pubic adornment in the form of a broken cowrie

shell or split seed-pod obviously not used for purposes of concealment. The women however wore a brief fibre-string skirt decorated with blue-grey "Job's tear" grass-seeds and a few iridescent mussel shells; even the tiny girls wore a skirt corresponding to their size. A necklace, an armlet or a plain bangle or two completed the attire of the comparatively unadorned females.

Like most of the villages through which we had passed, Anguganak is a long and straggling group of thatched houses precariously perched on the cliff edges. From the plateau magnificent views are obtained over the surrounding country; towards the coast one sees the wall-like Torricellis wreathed in mists; the east is a jumble of broken ridges and gullies; and towards the setting sun a mass of unnamed peaks pierce the low-lying cloud-banks. The people greeted us with the greatest friendliness, bringing quantities of food from the gardens on the lower ridges every afternoon. About the houses one sees many shrubs and flowers obviously not of local origin. Keen agriculturalists, these people eagerly collect sprigs of any new plant and coax them to grow in their gardens or around the houses. Dogs I saw too, mangy curs which lived on a vegetarian diet of discarded scraps of sago, yam, and taro. So that their dogs could not jump up over the low barriers into the houses the villagers had tied one foreleg with a sling: it made a very effective hobble.

Privacy for the white traveller in this country is something to be dreamed of but never experienced. All day long a curious crowd of males of all ages hovered around the camp, staring and drinking in every unfamiliar European gesture and movement. For the New Guinea natives the unconsidered trifle does not exist: they would dive like a flash on *everything* discarded, even scraps of paper or a cardboard carton, whilst an empty jam tin represented a real treasure. Despite the fact that I never had a bath unaccompanied by at least a hundred peering eyes, and never walked a yard unattended by a score of following piccaninnies, I was genuinely sorry to leave these interesting folk and once more return north towards the civilized country nearer the coastal ranges.

Journey to Hollandia, Dutch New Guinea

New Guinea weather may be accurately divided into two classes: the north-west (monsoon) season, which rages from November to April, and the placid south-east (trade winds) season, which occupies the remaining months of the year. My journey was unfortunately made during the north-west monsoon, when the beaches are soft and the water is high, making walking difficult and every river-crossing an added hardship. The first 90 miles of the journey from Aitape to Vanimo are fairly well known, and reports have no doubt been made and filed by the officials of both German and British administrations. A few remarks concerning one or two noteworthy features however may be of interest.

About 20 miles west of Aitape lies a large lagoon, bounded on one side by the ocean beach (through which opens a narrow entrance to the sea) and for the rest surrounded by dense jungle and sago swamps. The people living in the various villages on the banks of the lagoon have two major industries: making sago and collecting the special mollusc (*tambu*), so prized by the

interior people for ceremony and currency. The sago is traded by the lagoon-dwellers to the peoples of the islands off the coast (Tumleo, Seleo, Ali, and Angel) in return for earthenware pots; mollusc-shells are traded to the inland folk for weapons and food which they do not produce so well themselves. A happy trade balance is maintained with a simplicity that would puzzle an economist.

Crocodiles (*Crocodilus porosus*) are a constant menace along the coasts and larger inland rivers of New Guinea. When crossing a stream the line of carriers place their cargo on their heads, and with free hands beat the water, yelling wildly in concert as a means of defence. The natives told me of many fatalities. Fishermen were often taken, and those tending the fish-traps in the tidal rivers were particularly vulnerable to attack. The crocodiles boldly approached the villages, and unwary piccaninnies, dogs, and favourite pigs were always being taken.

Fifteen miles further on, beyond the village of Serra, a series of headlands

sweep down to the coast. They are of coral formation, forming an uplifted portion of the coast-line. The first is difficult to pass in the north-west monsoon, for the waves crash around the base, smothering the fragile, semi-protected native ladder with foam as the traveller climbs down to make a quick scramble over 40 yards of slippery rocks for the safety of the beach beyond. Between these headlands are delightful, cool, shady gullies filled with palms and ferns and wild hibiscus and magnolia trees. Jungle-fowl flit across the shadowy tracks, and the prints of wallaby, cassowary, and wild pig show in the damp sandy ground. This country is uninhabited; game is everywhere plentiful. The only signs of habitation are occasional rough shelters built by wandering natives. Once this fertile coastal country was probably heavily populated. In days gone by, epidemics of small-pox (the tell-tale pits may be seen in a few of the very old men even to-day) swept parts of the coastal areas, whilst other less malignant diseases no doubt took considerable toll as well. The country between Serra and Vanimo could support four times its present population.

Vanimo is a government station, deserted except for a couple of native police boys. It is said to be the furthest government post in the British

Empire, and although officially the border station, it is some 30 miles' walk from the international boundary of Mandated and Dutch New Guinea. Vanimo, pronounced "Wonimo," is probably a corruption of the native name Manimo, or perhaps a confusion of another native name, Warimo, which is a village close by. The people of the Vanimo district are paler and seem more graceful than their neighbours. Dr. A. C. Haddon has pointed out that one of the chief routes of Polynesian invasion of the Pacific was through seas skirting the northern coast of New Guinea, and several isles in this region are inhabited exclusively by pale people of a stock completely different from that of the mainland. It has been also suggested that the diversity of type along the coasts of New Guinea is due to spasmodic infusions of blood alien to the darker Papuan and Melanesian peoples which inhabit the island.

The dress of the people of the Vanimo district is peculiar. The males wear a small gourd from a pumpkin-like vine as a genital ornament, and apart from a few other bracelets and rings little else is worn. The women wear a soft bark cloth of generous measure swathed about the hips—a more substantial costume than I have ever seen elsewhere.

From Vanimo onwards the way is less well known. An annual visit by the tax-collecting patrol officer is the only time the natives see a European. Many of them however walk down the coast to Aitape in order to recruit for work in other parts of the territory. Natives get such a fair deal under the Mandated Territory administration that most of the sophisticated are always ready and eager to return to work after a brief rest in their village. This is excellent for the purpose of European enterprise, but it is doubtful if it does the tribe any good in the long run.

Wutong is some 25 miles by bush track from Vanimo. The carrier-guides hired at each village led me over sharp spiky patches of coral, up steep slopes and through dense scrubs infested with land-leeches which filled themselves with our blood. There were frequent delays, whilst the grumbling porters systematically deleeched themselves. Near the border I had a remarkably lucky escape when I trod on a death-adder lying among the leaves on the track. The two leading carriers had stepped right across the short ugly reptile without noticing it. I was aware of my danger only when it was felt through the thin sole of my canvas shoe; I leaped quickly away and despatched it with a stick before any harm was done. In Australia the death-adder is regarded as the most deadly snake, and it has already earned a bad name in New Guinea as the "kunai-viper."

Wutong is the village nearest to the border. We left the village early one morning in an attempt to get well into Dutch territory before nightfall. Half a mile past the houses one of my carriers pointed to a large block of concrete half-buried in the encroaching jungle. An inset copper plate tells the wayfarer that some 200 metres west is the international boundary line. I wondered why the block had not been placed exactly on the border until my guides pushed a few feet through the forest and paused at the foot of a steep wall of coral. We toiled up the plateau side, hauling ourselves up the slippery slopes by means of creepers and projections, and at last reached level jungle again. On this plateau I found the darkest forest I had ever

been in. For miles we struck due west, only seeing the sun when we reached an open space caused by the fall of some forest giant which had ripped a hole in the dense ceiling of leaves and tangling creepers. In the dim twilight of the scrub we could hear screaming parrots, hornbills, and other birds of the sunshine far above, but an occasional fleeing wallaby, cassowary, or wild pig was the only indication of animal life to be seen.

We at length reached sunlight, to find progress barred by a wide river, muddy and swollen by flood-waters. I consulted my map of the coast and decided that it was the Tami. There was no canoe available; it would have been suicidal to attempt to swim. A raft seemed to be the only solution. One of the boys discovered part of an old canoe-log stranded some distance up the river, and with another log, many cross-pieces and much "bush-rope" (vines) a rough raft was soon knocked into shape. It was a crazy craft, and it showed an alarming tendency to buckle in the middle when it reached the unruly waters of mid-stream. However it held together sufficiently well to enable me to transport carriers and cargo across to the sandy strand beyond, and after only two hours' delay we were on the march once more.

It was not far from the Tami that we met with the only suspicion of hostility shown during the whole trip. I happened to be leading, when I turned a bend of the path and found myself suddenly confronted by a native with a fish-spear. He was more surprised, if anything, than I; and probably more in fright than anything else lifted the weapon menacingly. I knew only one word of pidgin-Malay: *soba*, meaning friend. I shouted the word of peace; the cry was taken up by the carriers and the man at length stood aside and pointed mutely towards the village. We motioned him to enter in front of us; he did so, and a minute later we were surrounded by a crowd of shaggy natives, all chattering excitedly. Not one could understand pidgin-English, but by "sign-talk" I learned that some miles further on an oriental missionary had his station. This they told me by twisting their eyes in a manner characteristic of the Easterns; and we caught the word *lotu*, meaning "church" or "worship," repeated several times. These Sko people were a surly crew, and made it quite evident that our continued presence was not desired. They traded me a few green coconuts for the carriers to drink, but refused to part with sweet potatoes or the bananas which we saw ripening under the rafters. After a very brief rest we continued the journey.

The missionary was a Javanese, who lived with his miniature wife and a bevy of cream-coloured children in a native-built house near another village. He was hospitality itself: he fed the carriers and myself, and sent me away the following morning well stocked with food and with valuable directions for the next stages of the journey. We had to wade through a thorny sago-swamp for some hours and then climb yet another coral uplift, finally descending to the shores of Humboldt Bay, where I providentially met a Malayan officer and Javanese soldiers of the Netherlands East Indies Service, who took me in their patrol canoe for the rest of the journey to Hollandia.

Journey to Yalwi, down Nopan River to Witweis

This third journey occupied exactly one month. As in the trip to Anguganak, the initial route led over the Torricelli Mountains. Despite the six months'

Pot-making on the island of Tumleo

Carved canoe from the New Guinea coast

Witweis head-dress

Crossing the Torricelli range

interlude, little trace of rehabilitation was apparent in the broken ranges. The hills were still scarred and gaunt, the gullies still piled with twisted debris. The track however had been considerably improved by the native trading parties which frequently cross the mountains. In the foothills I saw creeping grasses beginning to stretch across to bind the crumbling soil of the land-slide scars, but it will be a century before the havoc of the ranges is finally repaired. Near Rauwetei, amid the foothills, about three-quarters of a mile of cliff face has slipped away, ruining acres of jungle below. As we went further into the hinterland, we heard many tales of lost lives and broken limbs as houses were buried or carried away in the great disaster. The natives still started apprehensively whenever a severe shake occurred.

The route now led south-east through Kapaum, Langin, and various hamlets into country east of Wapei. This back country does not appear to be as heavily populated as that closer to the coast, but the people seem to be of a definitely superior type. Perhaps this is to be correlated to the fact that game is plentiful "down below," whilst a wild pig or tree-kangaroo is a luxury indeed in densely peopled Wapei.

My chief impression of Yalwi was the astonishing diversity of flowers growing about the houses. Every decorative plant ever introduced seemed to have been eagerly snapped up by a son of Yalwi and carried back in triumph to the communal gardens. The inhabitants hospitably vacated a couple of houses in the middle of the village, and as before no difficulty was experienced in obtaining food or guides. A base was now established at Yemnu, a village of pleasant hospitable folk near the Nopan River. A few years before Yemnu and neighbouring Wititai had been burned, and a couple of murderers captured by administrative officials after the killing of some Wapei natives by the people of these villages. Allegedly the Wapei folk had first killed some of the Yemnu men; the murders were said to be by way of retaliation. The people of this area are for ever fighting among themselves, and on many occasions I heard reports of recent disputes. At one place a broken arrow, with red-stained barb still damp, was shown us by natives, who complained that a wounding had occurred that very morning. When it was suggested that they should go to the coast and make a complaint to the local district official, they emphatically declined, making it clear that they preferred to settle the dispute by methods of their own. Whilst we were at Yemnu a friend was attacked and fatally speared in country some 40 miles west. We were not informed of this however until near the coast many days later.

We left Yemnu to the roll of *garamut* drums: carved hollow logs which, pounded by the end of a pole, send an echoing boom far across the valleys and apprise neighbouring villages of a traveller's movements. There is a widespread belief that the natives of New Guinea are able to send comprehensive messages to each other on the drums, but in this and the preceding region at least the system seems to be merely comparable to the European army system of bugle-calls. In localities further east however natives are able to transmit complicated messages over considerable distances through a loud-booming, drilled conch-shell; others, in the Urat and Wam areas, are able to converse over short distances with an astonishing system of "whistle-talk" somewhat reminiscent of European Morse code. The people

through whose territory we were passing are able to transmit messages from ridge to valley over many hundred yards of forest by means of a mournful undulating wail, which we frequently heard when approaching their villages.

The line of laden carriers followed the winding course of the river past cane-covered flats and tall jungle-topped bluffs, where white cockatoos screamed at our intrusion. On the pebbly river beaches small sombre wading birds from the Arctic seemed strangely in harmony in the tropic jungle; and occasionally a glorious sunset-plumed bird of paradise flew heavily overhead. The same earthquake which had broken the banks on the coast at Aitape had shaken down precipices along this inland river. We passed the scars of many landslides, and noticed, high up on the ridges, the small coconut groves which inevitably mark the presence of a village. The guides finally left the stream and climbed in a western direction towards Witweis. We entered the village to the customary thunder of drums, passing houses precariously perched on the cliff edges. Dark eyes stared from the doorways at the line of strange carriers and the sight of European clothes. Two large dwellings were placed at our disposal, and the whole male population of the village stood and stared and stared as the cargo was unpacked and stacked in the houses. There were about thirty houses in the village, and in the square two great house-tambarans (ceremonial and men's communal buildings) stood towering over the rest. One was old but still in use; the second had been comparatively recently built to meet the increasing requirements of the community: a healthy sign. And physically speaking, they are a healthy people. Throughout my wandering in New Guinea I had become accustomed to meeting with a refreshingly high standard of health and fitness. At Witweis, beyond the sphere of European civilization, I did not see one bad sore or hear a single man cough. Even in the more accessible areas, where the people are subjected to the deleterious effects of white civilization, the health of the people is remarkably good, mainly owing, perhaps, to the efficient medical service of the Mandated Territory.

Witweis is nearly 40 miles as the crow flies from the coast, with perhaps one-half of that distance added again by the twisted jungle tracks along which we had marched. The people live close indeed to the manner of their ancestors. They still wear the picturesque head-gear, stab their neighbours with bone daggers, cut their sago with wood-handled stone adzes, and hunt with long black bows and barbed throwing spears as they did before white men ever saw New Guinea. Unfortunately this state of affairs will not last for long: two or three years hence will find them as half-sophisticated as their Yemnu friends; in ten years' time they will be on the same plane as the Wapeis. It is sad, but inevitable.

They brought us food with a shy readiness, but flinched and nervously retreated whenever the malignant eye of the camera was turned in their direction. Trading over, everybody (perhaps a hundred people) sat in groups in the dust and watched and waited. Hour after hour they sat, curiously regarding our every movement. Even though not the faintest trace of unfriendliness was detected, one was continually on the *qui vive*. A Yemnu native who had accompanied us as a guide was threatened with a spear by one of the locals, but very luckily no serious damage was done.

I was shown into the great dim house-tambaran (accessible only to males) and I examined the rows of stuffy little cubicles, each with a tiny fireplace in a pit below the twin beds of sago-fronds on which the men sleep. The light of my electric torch swept the lofty interior, causing gasps of admiration and astonishment from the people who clustered around. By gesture they explained the various objects of interest. I saw clusters of *kundu* drums, and tentatively tried their various musical tones as they hung from forked sticks dangling on rope from the ceiling. Carved figures painted with native pigment, with sex boldly delineated and legs twisted in fantastic shapes, occupied prominent positions. There were great wicker baskets to hold pig-flesh at feasts and strong wooden hooks to suspend game over fireplaces for roasting. Groups of fibre sheets studded with *tambu* shell; head-dresses of cassowary plumes, and bat-membrane; masses of the gorgeous bodies of king-fishers and paradise-birds attached to slivers of bamboo: regalia of the "sing-sing" or ceremonial, tumbled about in disordered array, they were reminders of glorious revels past and to come. Above the continuous roof of the low cubicles was a great armoury: bows and arrows of single and half a dozen blades, long throwing spears, and carved shields. The arrows were held in quivers of bamboo, and spare arrow-heads of many designs were stuck in convenient places. I left the house in a very thoughtful mood.

The people smoked half-dried local tobacco leaf wedged in tubes of bamboo. The leaf is for ever being relighted by bits of smouldering wood, which every smoker seems to carry. They chew betel-nut (*Areca*) enthusiastically, and obtain the subsidiary lime by roasting shells gathered in the river. The lime is carried in short bamboo containers scratched with intricate designs, which show prettily on the polished yellow surface.

I count my meeting with these primitive people among the happiest of my tropical experiences, but the joy of my visit is tinged by the regret that I too assisted in spreading the rash of civilization which is slowly tainting their lives. It would be a magnificent thing if at least one great reservation of wholly natural people could be established before they are all finally reached and dominated by European influences. One hopes that this ideal may become concrete in the untouched central regions of the island. One realizes too well that civilization and enterprise must proceed apace if Australia and the British Empire are to continue the ownership of New Guinea. But it is my hope that of the many hundreds of thousands of miles of territory at least some extensive tribal area may be rigidly protected by legislation[1] and unconditionally reserved for these unique survivors of the Stone Age, who still roam unmolested in the interior of the island.

[1] The recent and most commendable action of the Lieutenant-Governor of Papua, Sir Hubert Murray, in closing by legislation a considerable area of the Papuan hinterland, is undoubtedly a step in the right direction. The same might be said of neighbouring Mandated Territory, though the Administration has closed practically the whole of the unexplored hinterland to explorers and scientists as well as to exploiters.

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DISCUSSION

Before the paper the CHAIRMAN (Admiral Sir WILLIAM GOODENOUGH) said: Each time I come into this hall I find myself thinking and sometimes, as to-night, saying that of all the activities we take part in in this Society here is something which is of paramount interest and importance. I said that not long ago, prior to Mr. Smolka's lecture on the "Economic Development of the Soviet Arctic." Come some 6000 miles to the south, and a little to the east, and hear from another eye-witness, Mr. Marshall, of a very primitive place and people in New Guinea.

Mr. Marshall, though you might not think it to look at him, is already a veteran in travel. He was with John Baker in the expedition to the New Hebrides and has made several trips in North Australia. He hopes to go to New Guinea again. Of that I may speak a little later. He is an Australian by birth, and tells me is enjoying, for the first time in his life, this savage land to which he has come. Without any more ado I invite you, Mr. Marshall, to tell us of your experience and assure you that we shall listen with great interest and intelligence.

Mr. Marshall then read the paper printed above, and a discussion followed.

The CHAIRMAN: People sometimes arrive at an eminence where they are spoken of without any prefix, and that is why I call on Evelyn Cheesman.

Miss EVELYN CHEESMAN: I expected to enjoy Mr. Marshall's lecture to-night, and certainly have not been disappointed. I am quite sure I am voicing the opinion of everybody here when I say that when a man goes to such an interesting part of the world and brings it before us so freshly and so simply, it gives an extraordinary amount of pleasure which the author himself does not realize. Mr. Marshall has been through many different types of country, as he showed us to-night. I think perhaps we should have liked to have heard a little more about it than he has given, because, having experienced it himself, he does not realize that there is a lot we do not understand. The part of the country through which he went, although he has not said so, was in a great state of unrest. It has never been brought properly under control, and he might have met with hostility in many of the villages. But Mr. Marshall is just the type of man who gets on well with the Papuans. And that is why I am so very glad to hear he is going back to New Guinea.

It happens that I have also stayed in a group of islands where Mr. Marshall once went, the New Hebrides, and I thoroughly endorse every word he said about them. I remember quite well that when I left that group after two years

I was thankful I passed through Vila in the night-time so that I did not see the British flag flying there.

Mr. Marshall said that I picked him up in Aitape. I think we picked him up. I was just coming over from the Dutch border. After working in a mountain range in Dutch New Guinea, the only way in which I could get along the coast was by canoe. I had already had one canoe journey, and then at Aitape heard that there was somebody else who was also waiting for the steamer which never materialized. I should like to mention that the reason why I was put in quarantine was because I was not at a correct port of call. When you are travelling in a canoe you do not generally make for a port of call, but for wherever there are any white people who may be able to help you.

I must own that after a year in Dutch New Guinea I was not quite so fresh as when I started, but I think that Mr. Marshall was even more fresh than when he began. He was as zealously collecting natural history specimens as he had been a year before. He came up to the rest-house where I was nominally in quarantine, though I had many visitors a day. I remember very well his keenness in hunting for a flying-fox which he wanted to shoot. Unhappily, the paw-paws which attracted them were over, my boys having stolen most of them. So we tied up a bunch of bananas in the hope that the flying-foxes would come, and I remember Mr. Marshall and his friend sitting through the whole evening until midnight—or Mr. Marshall rather—while the flying-foxes gyrated round his head and were much too cute to believe that bananas grow on paw-paw trees. That was the last specimen which I think Mr. Marshall collected on that particular visit.

I should like to congratulate him most sincerely on what he has accomplished, and the large amount of country which he has investigated as well.

The CHAIRMAN: Lord Moyne may not have been in exactly the same territory as Mr. Marshall has visited, but he knows New Guinea comparatively well, and I am sure we should be glad to hear whatever he has to say.

Lord MOYNE: I feel diffident about speaking to-night to expert geographers, as my contribution to geography has merely been the involuntary enrichment of Admiralty Charts through wrecking or running various yachts aground on previously uncharted rocks, wrecks and coral reefs, besides more sandbanks and mudbanks than I can count. I do not therefore claim to say anything to you about New Guinea from the geographical standpoint, nor have I any technical knowledge of the racial problem, but you cannot go to New Guinea without realizing that it is the most interesting ground that still lies open for the anthropologist.

We must all have been struck by one feature in those wonderful photographs which Mr. Marshall showed us to-night: how the people of each village seemed extraordinarily uniform in type and yet between one village and another there were very strange and striking differences. There is no other part of the world where in so small a compass you will find four such diverse racial strains—the Negroid, the Australoid, the Malay, and even, according to some authorities, faint traces of the Mediterranean race—mixed in such a mysterious way.

It is largely due to accident that the engrossing problem as to how these races have mixed and reacted on each other still remains to be solved. New Guinea has been protected by the poverty of the natives. They have nothing to offer as a reward for economic penetration. They live, as Mr. Marshall has told you, in the Stone Age, and no trader finds it worth while to go and barter for their goods. Now that the prospector has found gold in New Guinea, that protection will gradually disappear, but Mr. Marshall paid a tribute to-night to the wisdom of the governments of Papua and the Mandated Territory in seeing

that the natives are not exploited by civilization. I think his phrase was "thinking Kanaka first."

The natives have also been protected in following their old customs by the difficulty of their languages. Mr. Marshall and Mr. Harrisson are now planning to go out not only to record the externals of these natives as other travellers have been able to do, but also to try to get inside their minds. That means a very patient and difficult study of their languages, which vary from one village to another in a most remarkable way.

In his lecture to-night Mr. Marshall was so modest about his achievement that those who have not been in New Guinea will probably not have realized the very formidable difficulties that he must have surmounted to carry out journeys which looked so simple on the map. He must have very great qualities of determination and remarkable tact in handling natives. I look forward to hearing him again when he and Mr. Harrisson and their expedition have spent a couple of years in New Guinea. I am confident that they will come back with a new light on those absorbing problems of geography and anthropology which New Guinea still offers.

The CHAIRMAN: I had only a fortnight ago a most interesting letter from Mr. Chinnery, Government anthropologist in Rabaul, New Guinea. He has travelled a great deal all over the part of New Guinea administered by General McNicholl and by Sir Hubert Murray. He wrote of just the things which Mr. Marshall and Lord Moyne have spoken of: the protection of the natives. I think we all can be assured as to that. Some people might say that it is not exactly our business, but, after all, geography covers a very large field. He said that they were trying to improve the people in their own culture, and not allow them to be exploited for purely commercial ends. I have not the letter with me or I would have read it to you, but I remember Mr. Chinnery said: "Do not listen too much to the criticisms which are made about our Government." He wrote a great deal about keeping up the high standard of the officials.

One of the most interesting points of all, referred to by Lord Moyne, is the diversity of the languages. I think very naturally in that connection of the book which was written by my father. You will find at the end of that book all the words which he some sixty-five years ago found in different islands and places. It is astonishing to note the differences, even in the numerals and in such words as "cat" and "dog." There seems to be no root from which they came. Anything which can be found out and worked up would be of very great interest to those who follow distributions of populations and languages.

I ought to have said in the beginning that Mr. Marshall is by profession—I might almost say by vocation—a zoologist, particularly an ornithologist. That is the reason perhaps why he showed us those charming photographs of the birds and the beasts of the country he visited. There is no doubt about his very great sympathy with all the natives whom he came across, and that is why we feel, when he and men like him go, assisted by the Society, into strange places, that we are in very safe hands, and that our reputation, which is very high, will in no way be let down.

It is my most pleasant duty to accord to you, Mr. Marshall, a very hearty vote of thanks for giving us a most delightful and suggestive evening. I hope that you will carry away happy recollections of an evening which has been essentially very pleasant to us.

THE DADESSA VALLEY: *A paper read at the Evening Meeting of the Society on 19 April 1937, by*

CAPTAIN A. DUNLOP

IN April 1934 Captain R. H. R. Taylor, R.A., and I, then stationed in Somaliland, decided to journey across Abyssinia on our return to England. We planned to start from Addis Ababa in December 1934, thereby avoiding the rains, and to walk westwards to the Dadessa river along the main caravan trade route to the Sudan. This route had recently been mapped and reported upon by Cerulli in 1928 and previously by several others, including Gwynn, Ilg, Camboul, and Le Roux. On reaching the Dadessa river, we proposed to strike northwards, following the western bank and mapping the river as far as its junction with the Abbai; thence *via* Abu Timbhor to Bumbode on the Sudan frontier.

Unfortunately this plan had to be modified considerably. Although the Abyssinian authorities granted us permission to travel by this route as far as the Dadessa–Abbai junction, they were adamant in their diplomatic refusals to permit us to follow the Abbai from the junction to Bumbode. After several attempts to obtain this permission, we abandoned the idea on the advice of His Majesty's Minister at Addis Ababa. Consequently we decided to strike westwards from the junction, rejoining the caravan route at Mendi and following it across the Dabus river, through Bani Shanqul to Qezan; the total distance to be covered on foot being some 500 miles. The date of our departure had to be postponed several times, each successive postponement bringing us nearer to the breaking of the June rains. At first Taylor could not start, as the work of the Anglo–Ethiopian Boundary Commission had not been completed. Then my leave was cancelled as a result of the tension caused by the Wal-Wal incident. However we eventually left Addis Ababa early in April 1935, accompanied by the uncomfortable feeling that we were racing against time.

The three principal objects of this journey were the correction of the existing traverse and the route reports of this main caravan trade route between Addis Ababa and Qezan. Secondly we proposed to make a compass-traverse of the hitherto unexplored Dadessa river, for those reaches which lie to the north of this main caravan trade route had been seen in two places by Le Roux alone. In 1901 he had journeyed from Tulu Ghinghi to the Abbai–Dadessa junction and then to the Angur–Dadessa junction, but in neither case had he followed the course of the river. Later in this paper more will be said of this journey and of the comparison between the points on the Dadessa mapped by him and our observations. Thirdly we wished to see something of the little-known parts of western Abyssinia: of the people, trade, and feudal system, and to collect specimens of reptiles for the British Museum.

Our caravan consisted of Taylor and myself; a Galla-speaking Amhara interpreter; a negro cook from Walamo, who proved himself exceedingly efficient; a Somali camp-boy and four caravan guards or *zabanias*. These armed stalwarts are essential to the welfare of a caravan, as robbers infest

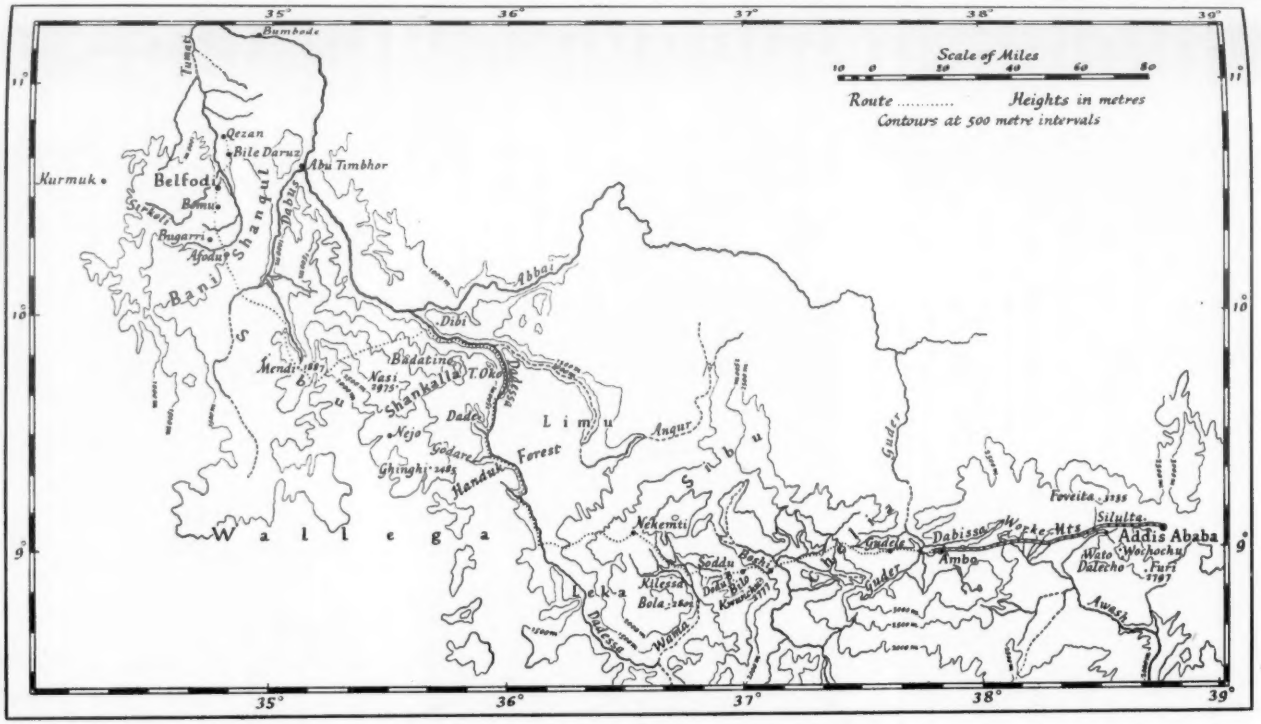
the hills along the main trade routes, preying upon the unwary. A chief muleteer, or *nagadi*, and his four assistants completed the party. This man was the source of constant trouble. He was lazy, sadly lacking in heart, and, even for an Abyssinian, abysmally ignorant of animal management. Ultimately at Nekemti he broke his contract to convey us to Qezan; this proved to be a blessing in disguise.

As numerous transport difficulties occurred during this journey, a brief description of the various methods of transport on this particular route and their rival merits will not be out of place. Except for motor trucks, which could then travel only as far as Ambo, some 70 miles west of Addis Ababa, mules, donkeys, porters, and camels are the normal methods of transport. Mules and donkeys are most common, for the weight of their loads and the length of their daily march compares favourably with their small cost of hire. It was found that mules could maintain an average pace of 3 miles an hour for 15 to 20 miles a day; while donkeys maintained an average pace of $2\frac{1}{2}$ miles an hour for 10 to 12 miles a day. The advantage of the donkey is that it costs less and is immune from the ravages of *doba* fly, of which there are belts in the Wama, Nejo, and Dadessa valley areas and in Bani Shanqul. Porters, though faster, carry but small loads and are infinitely more costly, while their periodical bouts of *tej* (fermented honey) drinking are as troublesome as the sore backs of the animals. Camels, capable of carrying heavy burdens, being immune to *doba* fly and not prone to sore backs, are employed extensively between the Sudan and Addis Ababa during the dry season (November to May). This method is exceptionally slow, owing to the hilly nature of the country and the numerous stretches of clay which, after the slightest rain, render sections of the route impassable to camels.

Geographically the route followed may be roughly divided into three sections: Addis Ababa to the Dadessa river; the course of the Dadessa river to its junction with the Abbai; and Mendi to Qezan. This paper will briefly describe the country traversed in the first and last sections, a more detailed account being given of the Dadessa river itself.

In 1935, before the road had been lengthened for the use of Italian punitive columns, it ran almost due westwards from the capital to the Emperor's gardens at Ambo. It is a well-graded road, following easily round the numerous spurs running into the Walata valley from the north. The country it traverses is generally of a rolling downland nature, interspersed with large patches of cultivation. Here we saw countless herds of native cattle, grazing in excellent pastures; and round each village Galla peasants toiling at the plough tail. The soil is rich, and produce such as barley, maize, potatoes, beans, and lentils flourishes. An atmosphere of agricultural and pastoral wealth pervaded the countryside. Between Addis Ababa and Addis Alam, some 26 miles distant, the road is flanked by well-wooded mountains. To the south the mighty peaks of Wochochu, Furi, and Wato Dalecho raise their timbered crests; while northwards Silulta and the more distant Foveita are clearly to be seen. At various places in these mountains there was considerable lumbering activity, owing to the rapid increase of building and the development of communications.

West of Addis Alam the road descends gradually to cross five narrow, deep



Captain Dunlop's route through western Abyssinia

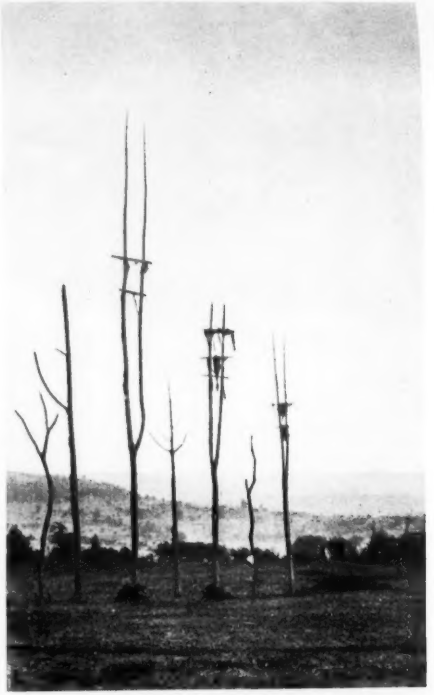
rivers. These, like the fingers of an outspread hand, rise a few miles north of the road in the Worke range of mountains, and uniting some miles to the south, flow into the Awash valley. The road then winds across a series of undulating cultivated ridges and, climbing gradually, reaches the growing town of Ambo: here it crosses a beautiful natural rock bridge, to finish abruptly at the Emperor's gardens just west of the town. The Emperor's intention was to extend this road to Nekemti (sometimes called Lekemti) and eventually to Kurmuk, where it would connect with the existing road to Er Renk on the White Nile. This would have increased the growing trade with the Sudan and improved internal communications between the potentially wealthy provinces of Leka, Wallega, Bani Shanqul, and the capital. In 1935, owing to the charm of the surrounding country and the medicinal properties of some hot sulphur springs, Ambo was developing rapidly as a resort for the European population of Addis Ababa. Its hotel under European management, its flour mill and ever-increasing number of villas, all testified to its popularity.

We left Ambo on April 13, the caravan track leading us across a hilly, cultivated area to the Guder river. Rarely have I walked through so charming a countryside and, in this stretch, under such ideal conditions. The spring air was cool and invigorating; countless hill streams plunged into the Dabissa valley, and wild flowers made patterns on the bottle-green carpet of fresh, young grass. It was pastoral perfection. A Catholic mission, surrounded by a small village, lies between the two streams of the Guder river. The good Italian Fathers showed us their hospital, school, and church, and then regaled us with excellent coffee and tales of the Chelia province. In return we were able to give them the latest news of the political situation, in which they were naturally interested. On our departure they presented us with a large basket of vegetables, which apparently grow like weeds in this district.

After crossing the western Guder stream by an ancient masonry bridge, the track becomes very steep. The surrounding country is mountainous, cut by numerous deep ravines and thickly wooded: admirable terrain for the *shiftas* (robbers) who infest this Chelia province. The origin of these particular robber bands is interesting. They are the descendants of the slaves of a *fitaurari*, who died without issue. After his death, being unclaimed and uncared for, they escaped and became highwaymen, preying upon unwary caravans plying along this much-used trade route. These *shiftas* watch the track by day from some concealed point of vantage; then, should they consider a caravan easy game, they attack it usually at night. Our *nagadis* were heartily afraid of these ruffians, attributing to them superhuman powers of observation, cunning and ferocity. At first they insisted on camping near a village, often curtailing a day's march by so doing. This was vexing, as it was essential for us to reach Nekemti, about 195 miles from Ambo, on April 19 or 20, in order to adhere to our time table, which allowed only a small margin at Qezan before the breaking of the rains. However we soon discovered that the lure of the villages was as strong as the *nagadis'* fear, and after a day or so ordered camp to be pitched in the place selected by us. Our method of guarding against attack by *shiftas* was an imposing display of strength by day, and by night a *zabania* sentry and a shot-gun, loaded with

Natural rock bridge at Ambo

Bridge over the Guder river



Galla memorials

The Dadessa bridge

The Dadessa river

Bamboo country bordering the Dadessa river

S.S.G., in our tent. On the march ancient Fusil-Gras rifles were carried by two of the guards; while the other two carried a ·375 Mannlicher and a shot-gun respectively. These were augmented by a ·45 revolver, strapped round the interpreter's waist, and Taylor's map tin; this, ostentatiously carried by the camp-boy, looked uncommonly like the barrel of an automatic weapon at a distance. Either these precautions, or perhaps the impoverished appearance of our caravan, deprived us of any entertainment which the *shiftas* might have provided.

At the village of Gudele, where we passed through a toll-gate, we were surprised by the civility of the officials and the fact that no attempt was made to extort money from us. It is worthy of note that nowhere on this route did we meet the rapacious toll-gate keepers, described to us by so many who had travelled in outlying districts. We had been told that the Emperor's pass was likely to be as great a hindrance as a help in remote places: on the contrary we found that it was a very definite asset, which is significant of the control which the Emperor was slowly yet surely gaining in remoter provinces.

Between Gudele and Gedo the country is reminiscent of the Scottish border. Here we saw for the first time a curious type of Galla memorial, which was seen only in the Chelia and Leka provinces. These memorials are erected near the *tukul* (hut) of a warrior after his death, to commemorate his deeds as a hunter and a warrior. They consist of a tall forked pole, across which several shorter poles are lashed; to these are tied a dummy rifle, the warrior's cartridge belt, and sometimes other accoutrements. Below, the skins of wild beasts and a phallic effigy for every man killed by him proclaim his prowess. Near Gedo the track descends a steep escarpment of about 1000 feet, and crosses the meadow-like valleys of the Alenga and Gibe rivers, which extend almost as far as the village of Boshi. Near all these villages, as travellers carry but little food, women were to be found sitting under some large trees close to the track with food for sale. Their wares consisted of a kind of large sour pancake; another portable food, consisting of a mixture of well-spiced, baked beans, grain, and Indian corn; jars of *tej*; sour butter and spices. The more important villages hold a regular market-day every week; to these markets women carry their wares from miles around. From early dawn till noon they are to be seen hurrying towards the village with baskets of food-stuffs, raw cotton, spices, and crude pottery. The buying and selling at these markets is done by the women.

At Bilo, a village of some size, we watched women spinning thread and a man weaving cloth on a hand-loom. These native manufacturers told us that a considerable quantity of their cloth, which was of a fine texture, was sent to Addis Ababa and some to the Sudan for sale. In the same village much building was in progress. The usual Abyssinian *tukul* is a round building with a conical thatched roof. The walls are made of wattles or boles of trees driven close together into the ground and plastered with clay, mixed with finely chopped straw. Some have two concentric walls of this sort, the space between them being used as a store-house and the dwelling-place for various domestic animals. The roof is made on the basket principle, thatched and supported by vertical beams. There are no windows or chimneys; a fire burns in the centre of the hut, the smoke just percolating

through the roof, while the entrance is usually covered by matting. Furniture is scanty: a dais of beaten earth or a rough framework of wood covered with skins serves as a bed; a few wooden or wicker stools, some rough earthenware cooking utensils, wooden plates, horn or wooden spoons and knives with bone or horn handles complete the inventory of household goods. Better houses, boasting windows and doors, are often built of masonry, while the increase of trade has led to the adoption of Western cooking utensils and furniture.

The march from Bilo over the Dodu pass was one of the most delightful of the whole journey. We started marching at 6.30 a.m.; it was a clear, chilly morning, the temperature standing at 52° F. The full moon and the valleys, veiled by banks of cloud, enhanced the splendour of the peaks of Gara Soddu to the north-west and Gara Kwunchu to the south-east. The rising sun was dispelling the clouds from the valleys as we climbed the pass. As we looked back across the valley towards Gedo, the varying greens of the trees and grass, the patches of red, freshly turned earth, the royal blue of the distant Sibu mountains and the ever-changing morning lights harmonized into a beautiful picture.

On the way we met two itinerant musicians: the one carrying his instrument, a small one-stringed violin, the other an enormous sword. On being asked to play, the violinist complied with alacrity and the broadest of grins. He drew his bow across the string at an amazing pace, producing a high-pitched but not untuneful jig tune. We halted at the summit of the pass; looking westwards across the wide, cultivated Wama valley, we could see clearly the lofty eucalyptus trees of Nekemti on a ridge some 30 miles away; northwards stretched range upon range of rugged mountains; to the south and south-westwards the Wama and Dadessa valleys encircled the wooded plain on the southern slopes of the Kilessa-Bola massif. We camped in the foothills to the east of the fly-infested Wama valley in order to minimize the possibility of mule infection. The temperature at various times during this day will give some indication of the climatic conditions: at 6.15 a.m., 52° F.; at 1 p.m., 85° F.; and at 4.30 p.m., when a storm swept over the camp bombarding us with hailstones the size of camphor balls, 56° F. The track then descends into the Wama valley, and after crossing the river rises comparatively steeply towards Nekemti, which is about 6 miles to the south-west of the magnificent peaks of Gara Tuka.

On April 20 we arrived at Nekemti, having sent word of our intended arrival to the Governor, Dejazmach Habte Mariam, the previous day. This was the only town worthy of the name on this route: it had developed enormously during the preceding few years, as the new school, warehouses, stores, and hospital testified. This development was due to its central position on the main trade route between Addis Ababa and the Sudan, to the agricultural and potential mineral wealth of the district, and to the progressive qualities of its hereditary ruler. He was a Galla, the ruling race in Leka and Wallega, and, unlike the majority of Ethiopian provincial governors before Italian occupation, was a native of the province over which he ruled. These Gallas live chiefly in the highlands, while negroid, aboriginal, subject races inhabit the valleys. It was interesting to discover that the Gallas had never

been conquered by the Amharas, and consequently, although by treaty they owed allegiance to the Emperor, no Imperial troops could be stationed in the province without the Dejazmach's permission. Unfortunately, limited space will not permit of a description of this interesting town; of its adolescent trade; of our meetings with its charming Governor; or the amusing incidents connected with a scene, in which we were molested by a Nekemti crowd. In spite of development, the chief architectural object of interest was still the mural painting in the church depicting the battle of Aduwa, mentioned by both Duchesne-Fournet and Gwynn.

Owing to transport difficulties we were forced to waste four days in Nekemti before we could hire porters to carry our kit down the Dadessa, and animals to convey the bulk along the caravan route to Mendi. The trouble started with the *nagadi*, who although under contract refused to take us on to Qezan. He complained that he had lost three mules from *doba* fly in the Wama valley and declined to run the risk of further loss in the infected areas of Bani Shanqul. Other *nagadis* and porters, hearing of our plight, also refused to transport our kit except at an exorbitant wage. Eventually we summoned the *nagadis* and porters and told them that if they were not prepared to accept a normal wage, we would burn all but our essential kit and food: these essentials we and our men would carry ourselves, thereby dispensing with their services altogether. Realizing that we were determined to carry out this threat they capitulated. We had originally intended to take pack animals down the Dadessa, but after a conversation with the Dejazmach we decided to employ porters. During this interview the Dejazmach, after examining our passes, took considerable pains to explain that the route, which we proposed to follow along the course of the Dadessa, was quite impracticable. He told us that nobody, even the local Shankallas, as far as he knew, had ever followed the course of the river to its junction with the Abbai. Admittedly, at certain times of the year, a few Shankallas worked in some cotton fields, which he had just planted 15 miles north of the Dadessa bridge; but even these few miles were, to use his own words, "a country fit only for monkeys." He emphasized the difficulties which we would encounter: no paths, thick bamboo forests, fever, and, with an expressive upward wave of his hand, the steepness of the mountains bordering the river. He suggested that, if we were anxious to see the confluence of the Abbai and Dadessa, we would be well advised to follow the track from Nekemti to Nejo, thence along a known track to the junction. This route had been explored and mapped some thirty-five years before by two Frenchmen during the governorship of his father, Dejazmach Kumsa. Indubitably this was a reference to the journey made by Le Roux and De Soucy in 1901. However after listening politely to his efforts to dissuade us, we told him that we still proposed to follow our original route. We could see that our determination to follow what to him was an almost impossible route sowed the seeds of suspicion. It was obvious that he disliked the idea of foreigners wandering unescorted through this unknown territory, and was convinced that we must have some ulterior motive for so foolish a journey. Ultimately he sent with us what he chose to call "guides."

After this interview we reorganized the caravan in preparation for the journey down the Dadessa. We decided to send the majority of the caravan

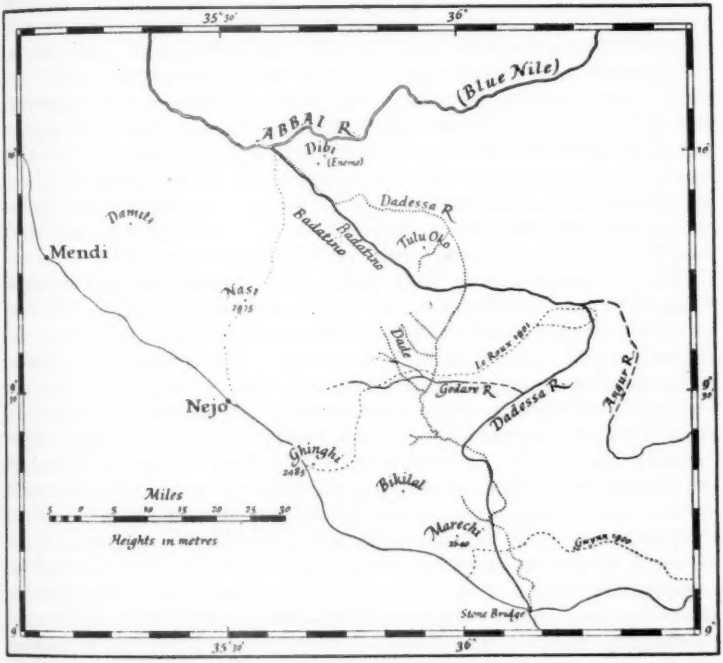
personnel and the bulk of our kit with the interpreter direct to Mendi, where they would await our arrival. We would take the Somali and one other *zabania*, the cook and one Gabre Madu, an excellent creature, who had attached himself to the caravan as our servant's servant. The kit and stores were tied into four loads of about 32 lbs. each, to be carried by four porters. At first they were delighted by the lightness of their loads and their handsome daily wage of threequarters of a thaler a day, little knowing the type of country they were about to cross. Finally, interpretation during this stretch of the journey would be made possible through the medium of the Somali *zabania*, who spoke Galla and, incidentally, Arabic, and of whose language I had a working knowledge.

Eventually the Dadessa party, including four of the Dejazmach's guides, left Nekemti on April 25, the main caravan leaving for Mendi the following day. The caravan route westwards from the town no longer follows the track originally traversed by Gwynn in 1900 and Le Roux in 1901: it now leaves the town in a south-westerly direction, running roughly parallel to and some miles south of the old track. This new route was traversed by Cerulli in 1928, his coordinates of the Dadessa bridge being used as the starting-point of our traverse of the Dadessa river. After leaving the town the track crosses a populated area of cultivation and rolling grasslands for some 13 miles; it then descends an escarpment into the Digdiga and Dadessa valleys. Looking westwards and north-westwards from this escarpment, one gets a splendid view of the Dadessa valley some 3000 feet below and northwards across the Angur valley to the Limu hills. In the reaches north of the Dadessa bridge the terrain on both banks of the river, known as the Handuk forest, is thickly wooded, while the higher slopes of the mountains are covered with a light-green vegetation, which in the distance appeared to be grass. Unfortunately, on closer acquaintanceship these apparently grassy slopes were found to be bamboo forests, which proved to be unpleasant obstacles on the march.

Of the mountainous region between the caravan track and the west bank of the Dadessa, Cerulli writes: "This mountainous zone appears to be purely and simply the southern continuation of the Sibu, which belongs to the region enclosed between the Dadessa and Dabus rivers, a region which both Ilg and Koettlitz describe as undulating with the highest points forming rectilineal escarpments along the left bank of the Dadessa, the highest part being formed of old crystalline rock." This is a concise, accurate generalization of the area. It was to the west of this area round Nejo that Ilg, the first European to penetrate into Wallega, was sent by the Emperor Menelik to reconnoitre for gold. Later, in 1896, as a result of Ilg's reports, the Emperor sent Camboul, an engineer, to carry out mineral research in Wallega for a year. He discovered considerable gold, iron, copper, and nickel deposits at Addis-Ouark, near Nejo, and quantities of lignite. As a result of his observations, he declared that it was probable that the area east of the caravan track towards the Dadessa was rich in minerals and that the peaks of Tulu Ghinghi, Tulu Tchoki, and Tulu Nasi were the heights of a gold seam. When this area is eventually exploited it will be interesting to see whether these predictions of Camboul's were correct and whether the gold deposits

in the Dadessa will compare favourably with those in certain reaches of the Abbai and Dabus rivers.

The track crosses the Dadessa by a well-built, arched, stone-and-mortar bridge, which is 95 yards long and capable of supporting heavy vehicular traffic. At this point the river swirls through a narrow rocky gorge bordered by thick vegetation. After crossing the bridge we struck northwards to the high ground above the river, camping on the night of April 26 about 2 miles up the river. The day's march had been shortened appreciably by the porters, who dropped steadily behind us, dawdling in the villages in the Dadessa valley.



The traverse by Captain Taylor and Captain Dunlop, shown by a dotted line, has been superimposed on the G.S.G.S. 1/500,000 sheet

On starting to march the following morning, we found that a Kenyzmach had attached himself to the party. Apparently Dejazmach Habte Mariam had ordered him to accompany us down the river. The prospect of this journey appeared to be as unsavoury to him as the idea of our attempting it had been to the Dejazmach, for he made a final effort to dissuade us. The Kenyzmach was accompanied by a squire of about twelve years old. This diminutive creature, who showed extraordinary endurance during the ensuing fifteen days, carried all his master's effects. Hung about him were a cartridge belt; two leather wallets, one containing money, the other food; a horn water-bottle; his master's spare *chamma* (shawl or plaid) and his rifle.

That day, after almost nine hours' marching, we had followed 8 miles of river only. The going was indescribably rough: Taylor and I went ahead of the porters, clearing a way for them through the dense bamboo thickets. Plunging continually into gorges and clambering out, using both hands and feet, was hard work for the porters. Eventually they dropped so far behind that we decided to camp; the Somali *zabania*, who had come forward with us, periodically blew a horn of the type carried by travellers in western Abyssinia, in order to guide them into camp. On reviewing the situation we decided that as we had only fourteen days in which to cover 170 miles of that type of country before reaching Mendi, it would be imperative to jettison the porters. Therefore we calculated our minimum requirements for fourteen days and divided them on paper into four and a half loads. Then, having sounded our own men on their willingness to continue carrying a light load each, we explained to the porters that speed was essential, and pointed out that although they had contracted to maintain our pace, having been given especially light loads and heavy pay, they had hopelessly retarded the day's march. Consequently the only course open to us was to send them back to the caravan track, and thence to Mendi, carrying our discarded kit, but at the normal wage. However they implored us to give them another day's trial, hoping to be able to retain their handsome daily wage.

It is noteworthy that up to this point rain had fallen almost every night, but not by day. However, from here until we reached Bani Shanqul it rained every night and on occasions by day. This affected us very nearly, as we had reduced our kit to a minimum, having now no coats or change of raiment except stockings and only one eight-by-six-foot waterproof sheet to serve as a bivouac. This, carefully erected each evening with regard to the wind and slope of the ground, enabled us to reach Mendi without getting wet at night.

On the following day (April 28), after marching for an hour and a half through the same type of country, the porters had dropped far behind. We halted, and on their arrival almost an hour later, re-sorted the loads in the manner arranged the previous evening. We then continued down the Dadessa, each of our men and myself carrying a load, while Taylor carried half a load and his mapping instruments. This was a fair division of labour, and I maintained as steady a pace as possible, while Taylor constantly dropped back taking compass bearings and then hurried forward to rejoin us. It also facilitated judging the distance travelled during each hour. The porters, accompanied by the Galla *zabania* and one of the Dejazmach's guides, turned back to the caravan track. Our progress now being infinitely faster, we covered some 8 miles by noon, halting by a fast-running, boulder-strewn tributary of the Dadessa, which contained perennial water. At the time we thought that this might be the Godare river: for although on the ground this river was miles south of its course as shown on the G.S.G.S. 1/500,000 compilation map, we had discovered already that features shown on it in these reaches were the merest approximations.

The cotton fields of which the Dejazmach had spoken were passed the following morning: they were quite extensive and appeared to be flourishing. Later we heard that this Dadessa valley is extremely rich cotton-growing ground. The journey onwards to a point just south-west of Dibi (Tulu

Enemo of previous maps), which lies in the apex of the angle formed by the junction of the Abbai and Dadessa, was accomplished between April 29 and May 6. On May 1 we crossed a wide river of perennial water and another the following day. The valley of the latter lay in a general north-west–south-easterly direction, below and to the west of the prominent Dade ridge; while the former joined the Dadessa from an almost due westerly direction and was probably the Godare river. Onwards the country traversed was of the same mountainous, thickly wooded type, intersected by rivers and numerous deep ravines. The details of this stretch are not interesting geographically, but live in our minds as a period of personal discomfort and fatigue, during which we experienced extremes of temperature, while rations were short and marches long. As an indication of the difficulties of marching through this type of country, which are stressed by Le Roux in his book, 'Menelik et nous,' we had to march for 8 or 9 hours a day between the Dadessa bridge and Mendi in order to complete the journey in the allotted fifteen days. During this time we subsisted on a diet of rice, dates, marmite, tea, and sugar.

On May 4 we met three Shankallas grazing a small herd of sheep and cattle on the slopes of Tulu Oko. This was most fortunate, as one of them, after considerable persuasion, agreed to accompany us. He was invaluable, being able to indicate prominent features by name, to point out where the Abbai–Dadessa junction lay beneath Dibi, and ultimately to guide us by the quickest route back to the caravan track. Through him and his companions we were able to determine that Tulu Oko, a prominent hill situated in the main eastern bend of the Dadessa, and on which Taylor had taken numerous bearings, lies to the west of the river, and not to the east, as shown on all previous maps. They were unshaken in their repeated affirmations of its name, refusing to accept our suggestions that various other mountains on the opposite bank might be Tulu Oko. From this hill they pointed out the lofty Badatino ridge, and southwards the prominent peaks of Dade, below which the Dadessa, bending sharply to the north-east, begins to describe its main eastward curve. The comparison between this curve and the main eastward curve shown on the G.S.G.S. 1/500,000 compilation map of Abyssinia is interesting. The only data then obtainable for plotting the latter was presumably contained in Le Roux's time and compass traverse from Tulu Ghinghi to the Angur–Dadessa junction, and from Nejo to the Abbai–Dadessa junction. The extension of his compass bearings of the course of the river at these two places was plotted as the possible course of the river; in neither journey did he follow the course of the river itself. Moreover as Le Roux journeyed to the Angur with animals, and in his book constantly emphasizes the difficulties of this route, it is probable that he considerably over-estimated the distance, thereby making the curve more pronounced than it actually is.

Taylor closed his compass traverse on Dibi. His remarks on the 1/250,000 map of the Dadessa river made by him and now in possession of the War Office are as follows: "The position of the Dadessa river was fixed from a time and compass traverse of its western bank. The traverse started at the stone bridge over the river on the Nekemti–Nejo caravan track. The coordinates of the starting-point (the bridge) are those found by Cerulli in 1928. The

traverse has been closed for scale on the highest point of Dibi, a hill a short distance east of the Dadessa–Abbai junction. A very small adjustment only was required to make the distance from the bridge to Dibi agree with that measured from the G.S.G.S. 1/500,000 compilation map. The traverse has not been adjusted to Dibi for direction. In plotting it was assumed that the magnetic variation was nil, as the compass had been tested against azimuths in British Somaliland a short time before and had no instrumental error. No trouble was encountered due to local attraction, which need not be considered. When the traverse has been swung to allow for magnetic variation, the position of Dibi will in all probability agree closely with the position found previously, the difference between the traverse and map position of Dibi in angular measurement from the bridge being 4 degrees. After this magnetic variation adjustment has been applied to the traverse, it is considered that its directions are probably more accurate than those used in earlier fixings of Dibi."

Unfortunately, owing to limited time, we had to hurry through the beautiful country lying between the Dadessa–Abbai junction and Mendi, crossing high tangled hill ranges and peaceful rivers. It is difficult to describe the beauty of stretches of that orchard-like country, with its wealth of wild flowers: irises, narcissus, gladiolus, canna lilies, hyacinths, scabious, clematis, a kind of sweet pea and orchids. In the Shankalla villages through which we passed only a few of the inhabitants had seen Europeans before. The adults showed a keen and friendly interest in us, but surprisingly enough the children viewed us with utter unconcern. The men were clothed in loin-cloths made of skins. Most carried a barbed spear or club-headed axe and a thin long-bladed knife. We met one man who possessed an ancient Steyr rifle and a cartridge belt, filled with empty cartridge cases! Many of the men wore a metal ring in the lobe of their left ear; this we understood was the insignia of marriage. The women, though sometimes completely naked in the villages, usually wore a loin-cloth similar to those worn by the men, while their ornaments were silver bangles and a fringe of leather tied to the outside of their arms below the shoulder and hanging to the elbow.

We reached Mendi on May 10, and after spending a day and a half reorganizing the caravan for the final lap of the journey, which included engaging fresh *nagadis*, we left Mendi on May 12. Our kit was now carried by a herd of donkeys, for at that time of year no mule caravans cross the Dabus river into the fly-infected areas of Bani Shanqul. For some twelve miles west of Mendi the track follows a series of ridges through an orchard-like area, then drops gradually through bush country into the Dabus valley. In this latter stretch we passed small patches of cultivation and considerable areas of cleared bush, which indicated the increasing agricultural efforts of the local Shankallas, though these efforts appeared to be confined to the growing of beans, maize, and Indian corn. The people, though racially identical to the Shankallas of the Dadessa region, are more sophisticated. This was evident by their lack of interest in us and by the lengths of cloth, as opposed to brief skins, worn by the men and by the women's red-and-yellow bead ornaments.

Eventually, after running for some miles through the wide Dabus valley, in which there were numerous villages and large herds of cattle, the track

The market at Dade

Shankallas of the Dadessa region

Village of Mendi

Crossing a stream between the Abbai–Dadessa junction and Mendi

Dade mountain

Qezan

led us to the river. This is the march between Bani Shanqul and Wallega, and was the western extremity of Dejazmach Habte Mariam's vast territories, his eastern boundary being the Wama river. The Dabus in these reaches is some 70 yards wide, deep, swift-running, and prone to sudden floods. At the ferry, where the banks are steep, caravans off-load and wait their turn to cross in the dug-out canoes of three local ferrymen, who appeared to have the monopoly. Their animals are either driven across a ford, a mile and a half east of the ferry, or are swum across alongside the canoes. The ford is little used by laden beasts except camels, as for the greater part of the year the depth of water does not permit it. While waiting for our kit to be transported we entertained ourselves by watching a few aloof Amharas, the Gallas merry and chattering, the bovine Shankallas, and the swashbuckling Shoghalis on the bank. The name "Shoghali" is a vague term applied locally to the admixture of races inhabiting Bani Shanqul. Their rulers are generally of the Fung or other tribes from further north, who originally came into the country as traders, the aboriginal races being the Bertas and Buruns. In their villages, west of the Dabus, the Christian church of the Galla gives place to the mosque, and the Galla greeting to the universal Mohammedan politeness: "Salaam Aleikum." In contrast to the Galla and Amhara dress, consisting of a shirt with close-fitting sleeves, jodpurs and *chamma*, they wear a white skull-cap, pugaree, flowing coat with loose sleeves and baggy trousers. Every man carries an elbow knife and most a rifle and a straight, broad-bladed sword.

Between the Dabus and Belfodi we were able to correct considerably the existing route reports and map, as the position and names of some villages, and in places the direction of the track, have altered. After leaving Mendi the temperate vegetation of the uplands had gradually yielded to scrub, thorn trees and acacia bush; while the temperature in the shade at noon rose to 101° Fahrenheit. In this stretch we met numerous caravans of donkeys driven along in a herd, and almost invariably led by a *nagadi* bearing the tent poles. We were usually warned of their approach by the *nagadis'* shrill cries of encouragement, or their quietening "hoosch-hoosch," when stopping to adjust a load. Such warnings were invaluable, as the chaos caused by a head-on meeting in a narrow place resulted in lengthy delay. These caravans from Qezan and Kurmuk carried bales of cotton sheeting, matting, and cheap household goods; while the *nagadis* themselves, often crowned with tiers of new felt hats still in their paper wrappings, were slung about with the more fragile freight such as kettles, pots, and pans. Westbound caravans, on the other hand, bore the coffee, beeswax, spices, and pepper of the Abyssinian plateau to the Sudan.

The country approximately west of the caravan track and between the Dabus and Laga Mengi was ruled by Shoghali, while to the north-east lay the territory of Dejazmach Mustapha. Shoghali, the dominant chief of Bani Shanqul, was an interesting old man, then reputed to be one hundred and fifteen years old and blessed with more male offspring than years of his life. He maintained a strong autocratic rule by placing his favourite sons in positions of authority throughout his province, while his attitude both to the Emperor, to whom he ostensibly owed allegiance, and to the British rule in the Sudan was one of casual independence. This attitude was fostered by the knowledge

that British protests against his slave raids had to be made at Addis Ababa; moreover his territory, far removed from the capital and joined to it only by this rough caravan track, afforded him considerable protection from the Emperor's wrath.

Between Bomu and the Sirkoli river the country was more open, and although the track climbed over several low ridges, the general trend is a gradual downward slope towards the north and north-east. At the Sirkoli, Taylor, who had been collecting throughout the journey, reported the capture of five new lizard specimens and a young crocodile. His untiring energy in collecting reptiles had been rewarded by a considerable and representative collection, which is now in the possession of the British Museum.

On the night of May 19 Taylor camped at the Shimala river, a tributary of the Tumati, 8 miles from the British frontier post of Qezan, while I went on into the village to ensure that our transport arrangements from Qezan to Er Roseires were not awry. It was fortunate that we adopted this plan: for although we had sent a *zabania* five days' march ahead to give warning of our arrival, the motor-truck originally ordered for us had departed with a load of merchandise, fearing that it would be stranded in Qezan owing to the early breaking of the rains. It was fortunate that we found another, for the village, standing on rising ground in the midst of the Tumati valley, is almost entirely isolated after the rains break; and low-lying ground, and the number of rivers to be forded between it and Er Roseires, render the track impassable. The village is a collection of native huts and boasted a square of brick buildings, erected some six months previously. These belonged to three Greek traders, who were prospering by trading with natives on both sides of the frontier. A profitable minor enterprise was the purchase of gold dust, smuggled across the frontier, for a yard or two of cloth or some cheap trinket. Whilst I waited in the shop of one of these merchants, five ounces of gold dust were brought in by Shankallas from the mines at Gogobil on the Dabus, and the merchant told me that he had already received seven ounces that day. This gold dust was purified locally and sold in Khartoum at £5 to £6 an ounce.

A police post consisting of a Sudanese Inspector and eight askaris kept law and order in the district: the cleanliness and orderliness of the village and their spotless kit and quarters were evidence of their efficiency. On May 20, after bidding farewell to our caravan, who were returning to Addis Ababa to be paid off by the Vice-Consul, we climbed into a ramshackle motor-truck and reluctantly turned our backs on Abyssinia.

Note on the doba fly

Dr. H. Scott writes: I have discussed with Captain Dunlop the identity of the *doba* fly, which occurs in definite fly-belts lying across the main trade route between Addis Ababa and the Sudan. As far as possible *nagadis* avoid taking mules through these belts during the rains, when the likelihood of infection is great, and use donkeys instead. Donkeys and camels are said by the natives to be immune. Unfortunately no specimens of the fly were kept. Major E. E. Austen tells me that the information about the disease is suggestive of a form of trypanosomiasis, possibly mechanically conveyed by some species of horsefly (*Tabanidae*), rather than carried by a tsetse-fly (*Glossina*). If this surmise be correct, the *doba* is related to, or possibly even identical with, the

fly described and figured by James Bruce, in the Appendix to his 'Travels to discover the source of the Nile' (edition 1, vol. V, 1790), on the habits of which he enlarged in vol. I of the same work. Bruce named his fly *tsaltsalya*, a name which he stated to be Ethiopic, and he said it was also called *zimb* (the ordinary Amharic word for a buzzing fly). The *tsaltsalya* was said to inhabit a region of black earth on the confines of Abyssinia and the Sudan, and to cause an annual migration, during the rains, to the sandy plains of the Atbara, of herdsmen with their immense herds of cattle, in order to escape its ravages. *Tsaltsalya* has been thought to be a tsetse-fly, but it is evident from Bruce's figure that it is really a horsefly, and is probably a species of *Pangonius* (see E. E. Austen: 'Monograph of the tsetse-flies,' pp. 121–123, 1903).

Note on the spelling of names

The spelling of names is that preferred by the author and is not always in accordance with the decisions of the P.C.G.N.—Ed. *G.J.*

DISCUSSION

Before the paper the PRESIDENT (Professor HENRY BALFOUR) said: It is a very great pleasure to me to introduce to you our lecturer, Captain Dunlop, who has been in a region which has in recent years become of rather special interest to the whole world. He is going to describe to us a part of Abyssinia which was hardly known until he ventured to penetrate and survey it: the Dadessa valley. It is quite possible that some of those present this evening may not have realized where the Dadessa valley is. I cannot exactly blame them, because I have tried to find it in a number of up-to-date atlases and it simply is not there. But it does not follow that the valley does not exist. I think Captain Dunlop is going to persuade us that there is such a place and give us a description of the newly-surveyed area. I will not intervene longer because I know he not only has a very interesting paper but also a large number of slides to show us. I call upon Captain Dunlop to read his paper.

Captain Dunlop then read the paper printed above, and a discussion followed.

The PRESIDENT: We are fortunate in having with us this evening Major Cheesman, who is not only a medallist of the Society but knows more about Abyssinia than probably most Abyssinians themselves. I ask him to be kind enough to tell us something further about the area.

Major R. E. CHEESMAN: I am afraid I cannot quite live up to that very complimentary introduction, because as a matter of fact the longer you live in Abyssinia the less you know about the country. I have lived there for nine years, so that I am really at a great disadvantage. I must congratulate Captain Dunlop and Captain Taylor particularly on the very difficult journey they made along the Dadessa river valley. You saw by the excellent photographs what a rough passage it was. Trying to follow that river, as they did, dropping many of their porters and their transport, stumbling over those rocks and carrying their own kit was a very fine feat.

Captain Dunlop said that they were pursued by the rainy season. I can quite appreciate that. If you get caught by the rains it means not only discomfort but you get the *doba* fly. I did not get it but the effect was the same. When you are in the low country the horse goes down very quickly, the mule next, and as you generally have mule transport you are likely to get caught in the lowlands and lose every mule. Then you have to leave your stuff in the desert, and get back to the hills.

It is very strange that whatever arrangements you make for travelling in

Abyssinia something always delays you, although you may have fixed everything perfectly. You start at the beginning of the dry season and have a few months good weather in front of you, but something always happens and you are eventually chased by the rainy season. When I was going down on the Abbai my consulate was burned down. I had arranged to start in good time, but I was delayed and, like Captain Dunlop and Captain Taylor, I was pursued by the rains.

The position of the Dadessa river is a very important addition to the general mapping of the Abbai. I went down on the Blue Nile or Abbai, on the other bank, and saw in the far distance the valley of the Dadessa. We want the longitude of that country to straighten it up. Our longitudes there are very uncertain. I had a most interesting letter from Major-General Sir Charles Gwynn, who was one of the earliest to see the Dadessa. He said that in his day—I think 1901—he was doing survey work on the frontier and also went from Addis Ababa to Er Roseires. My compass traverse ended at Er Roseires. He found its old position was 48 miles out in longitude, which is a considerable amount for a big town such as that. I tried to get the longitude too but something always frustrated me. The first time I went I used a pocket chronometer, and after about eighteen months when I got back to a wireless station the pocket chronometer proved to have been keeping an uneven rate and to be quite unreliable, so that my latitudes were all right but the longitude no good at all. On my next leave I tried another plan and borrowed a wireless set from the Royal Geographical Society. It was a big affair. That was some years ago; things have improved a great deal since. I got the set as far as Khartoum and telegraphed for permission to take it into Abyssinia with me, but was refused. So I had to send the set back to the Royal Geographical Society and give up the idea for the time being.

On the next occasion I took my own short-wave set; quite a small affair, but the electricity was rather a difficulty. I arranged to have a battery sent out to me by post. I got the set through, but when I sent down to the frontier 180 miles away, that being my nearest pillar-box, to get my mails the men came back with a little slip from South Kensington Post Office to say there was a parcel there under-stamped waiting for me! If there is a chance for somebody to take the longitude somewhere in that region, it will put a lot of journeys right as far as longitude goes.

Bani Shanqul is a strange name. Weld-Blundell, who travelled there and who was quite an authority on tribes but not much of a surveyor, says it was derived from the Arabic for the sons of the Shankalla (negroes). It is interesting country to travel in because of the gold. I heard amazing stories of people who had been there. One man is said to have come up the White Nile on the river boat and took a lump of platinum out of one pocket and a large block of gold out of the other. He said he had been in Bani Shanqul. I think he had come on the old gold workings there. There is no doubt that from very ancient times a certain amount of gold has been washed from the rivers, and at some of the workings they found platinum a great nuisance. When they removed the gold they left some lumps of platinum. I do not however think there is a large amount of gold there because geologists have prospected for a great number of years past and they have not really found any quantity of gold as far as mining people consider it. The natives every year still go down and wash a certain amount out from the Dadessa and Dabus rivers.

I can quite appreciate all that the journey undertaken by Captain Dunlop meant, because of my own experience of those rough and difficult areas. As a matter of fact, I travelled in much greater comfort than did Captain Dunlop

and Captain Taylor. I think that my caravan more resembled a travelling circus. I rather doubt whether I should have got through if I had tackled what they did. I congratulate them both on their excellent journey.

The PRESIDENT: Captain Taylor has several times been referred to in the course of the paper and as he accompanied Captain Dunlop and also was responsible for the greater number of the beautiful photographs that we have seen, I will ask him to be so kind as to supplement what Captain Dunlop has told us.

Captain TAYLOR: I have really little to add to what Captain Dunlop has already said, but I should like to stress the fact that the map you saw portrayed was arrived at by very rough methods. It must not be thought a map of great accuracy. You could only advance by pushing your way through trees, so that the only means of judging distance was to estimate the speed and note the times when you left one point and when you arrived at the next. You could not estimate by actually counting the paces, and the growth was far too thick to try to pull a 100-feet rope or tape through. To obtain an accurate map would have meant cutting the trees. Time prevented that in our case, to say nothing of the difficulties.

I think however that the actual direction shown on the map of the position of the Dadessa is fairly correct, as I was able to take shots to various hills throughout the whole journey and from one hill in the middle of the Dadessa tract I was able to take a compass bearing on the place we started from and the place where we finished. But how much more accurate we shall be than Le Roux will only be known when the air-photograph map is produced by the Italians, probably during the course of the next few years. They are making a series of maps by air-photography, and when I left Addis Ababa in November last they had already completed one strip from Addis Ababa to Nekemti. I think that was being continued to Gore, and no doubt soon they will get the Dadessa fixed. Probably then Major Cheesman will be able to get his longitude.

The PRESIDENT: I do not know whether there is anybody else in the audience who has been to Abyssinia; if so we should be very glad indeed if he would come up and speak to us.

Dr. HUGH SCOTT: My excuse for coming on to the platform to add my tribute of congratulation to the travellers is that at the end of 1926 and the beginning of 1927 I conducted, in company with a colleague, Mr. J. Omer-Cooper, a natural history expedition of nearly six months in the highlands of Abyssinia. Our principal object was to obtain insects and plants. Many thousands of insects were collected and are now in the British Museum, and we also got a number of plant specimens. I cannot claim to have made any one long journey into such little known regions as Captain Dunlop and Captain Taylor visited, but I was in some parts which have been visited by few Europeans, and, putting several shorter journeys together, I trekked over about 500 miles of country. Like the previous speakers, I am not entirely unacquainted with the gentry known as *shiftas*.

As we proceed with the working out of our collections we find—and this is where the information Captain Taylor obtained will afford interesting additional evidence—that the insects which we got at the intermediate altitudes (about 5000–7500 feet), where a thorn-scrub type of country prevails, are forms which have a very wide distribution, extending in some cases right from the north of Abyssinia down through the high parts of eastern Africa and right down to South Africa, the species sometimes being the same or at any rate very closely related. But of course when one gets up to the detached *massifs* and mountains at between 8000 and 12,000 feet—about 12,000 was my highest point—on each of them there are distinctive forms. What I am saying applies particularly to

certain flightless beetles which have lost their wings, and to grasshoppers which have either partly or entirely lost their powers of flight.

I am quite unacquainted with the western country, the further part of Captain Dunlop's and Captain Taylor's journey. When the fauna and flora of that district is worked out it will throw very interesting additional light on these bio-geographical problems. There is not only the problem of the apparent remains of a northern flora and fauna scattered among the African flora and fauna on the high mountains. There is also the further question of the relation between east and west Africa. The butterflies that we collected have been studied, together with the much larger collection made by Sir Arnold Hodson and by Professor Hale Carpenter of Oxford, who has devoted particular attention to the relation between east and west Africa, finding in some cases actual identity of species right across the continent and in other cases very close relationships. There are many curious problems to be solved which I will not enlarge upon further, but I will repeat that anything which these travellers have brought back is sure to be a source of interest and additional light on the subject. Once more I should like to add my word of congratulation to them.

The PRESIDENT: I am sure we have all enjoyed this evening very much indeed. We could not have had a more vivid description of what was a very important traverse bringing in new country. I can only hope that this new valley will now, out of compliment to Captain Dunlop and Captain Taylor, take its place upon the ordinary maps. I think, in justice to them, it should. Even if the survey is not strictly accurate to an inch or two it is a great advance upon what there has been hitherto. When the crucial matter of longitude is finally settled, as I hope it may be, the importance of the area will be brought out.

One rather fears that considerable changes in the economics of the region will result. Captain Dunlop has referred to some of its potentialities, mineral and otherwise. They are likely to be exploited in the near future, and to lead to changes which will to me—and I am speaking as an ethnologist—always touch a note of sadness. When the traditional customs in an area are changed, that part of the material which I am supposed to study is spoiled. So I take a rather personal interest in the matter, and I can only hope that an intensive study of the culture of the people will be made before the changes are too marked.

Captain Dunlop has shown us what can be done by travelling light, if the traveller is willing to forgo ordinary creature comforts. Captain Dunlop and Captain Taylor were not averse from carrying their own loads in order to dispense with the cumbersomeness of an extensive *safari*. That is an important matter when time is short. They certainly were able, by reducing their stores to a minimum and living really hard, to perform a piece of work which otherwise they could not have accomplished in the time. I think they are to be heartily congratulated upon a most interesting and important contribution to geographical knowledge. I ask you now to express your thanks to Captain Dunlop and to his companion, Captain Taylor, for an excellent piece of work, the results of which have been put before us in so lucid and interesting a manner.

THE GEOGRAPHICAL IDEAS OF ROBERT HOOKE: *A paper read at the Afternoon Meeting of the Society on 12 April 1937, by*

E. G. R. TAYLOR

IT is comforting to reflect that even persecutions and revolutions may have their uses. For then the intellectuals of the day, who can see both sides of a question and hence are excluded from public life, either go into retirement or travel abroad, occupying themselves with the pursuit of science. We owe to the English Protestant refugees who went to Germany and Switzerland in Mary Tudor's days the first systematic study of geography in this country. To the disorders of the Civil War we may trace the strength, if not the actual inception, of that intellectual movement from which the Royal Society was born; and in particular it was due to the Civil War that a special orientation was early given to the many-faceted mind and experimental genius of Robert Hooke.

Hooke, who came of yeoman stock, was born in 1635, and as assistant at Oxford to Robert Boyle, was brought into touch when only twenty-one with such men as Seth Ward (his first patron), Bishop Wilkins, and Sir Robert Moray, presently to be among the founders of the Royal Society. Moray was much abroad with the exiled King Charles, and among his close friends and scientific correspondents was another exile, Alexander Bruce, afterwards Earl of Kincardine, who spent the interregnum in Holland. Bruce was the patron of Christian Huygens, then engaged upon his great invention of the pendulum clock: an invention of no mere academic interest, since it was believed that this new timekeeper would solve the age-old problem of longitude at sea. Moray brought reports of the Bruce-Huygens clock to the circle in which young Hooke was working, and to news of a fresh invention Hooke's reactions were invariable—"I thought of that long since"—"I could make a better one myself." He set to work on the design of a new timepiece "to measure the parts of time at sea (so he promised) as exactly and truly as they are at land by the Pendulum Clocks invented by M. Huygens." The actual workmanship of this timepiece was entrusted to Thomas Tompion, an instrument-maker to whose exquisite precision Hooke paid generous tribute. This was the genesis of the first spring watch.

Immediately upon the Restoration Lord Brouncker (afterwards first President of the Royal Society), with Robert Boyle and Sir Robert Moray, formed a syndicate with Hooke to patent and exploit his watch. At the last minute however Hooke drew back and refused to go on with the matter, on the ground that an unfair clause in the patent might rob him of his invention. It is possible that he had other reasons, which may be inferred from a statement that he made in 1673 when reviewing Huygens' published account of the Pendulum Clock. "It was in 1658 and 1659 that I endeavoured to obtain a reward from the States (*i.e.* the Netherlands) for discovering a practical and certain way of discovering the longitude of places by sea and land, but upon enquiring concerning such a reward I was answered that there was never any such thing . . . the like answer I received concerning the imaginary promising in Spain and France: nor could I find any better encouragement here in England

when I propounded it in the year 1660, though yet I am sure my way was certain and very easily practicable, and might possibly be the occasion of putting my Lord Kincardine in mind of making trial of the pendulum clocks." Hooke was no more indifferent to money than any other good business man, although after 1687, when his wayward niece Grace died, and there was no longer any one to whom to give jewellery and satin gowns, he used to put it into an iron box and forget all about it.

The trials of Huygens' clocks at sea by the Earl of Kincardine and Major Robert Holmes were followed with the keenest interest by members of the Royal Society (including Mr. Pepys), and Hooke himself in 1662 carried out private trials, which were watched by Lord Brouncker and Moray, on board the King's pleasure yacht *Katherine*. His conclusion was adverse; the motion of the ship destroyed the regularity of the pendulum's motion. But for more than twenty years Huygens remained sanguine of success, and among his letters to Sir Robert Moray is one which records his almost ludicrous indignation and dismay on learning that Lord Kincardine proposed to pocket one-half of the expected reward, and considered himself to be making a very generous gesture in allotting the other half to the inventor.

Hooke continued to occupy himself through life with the longitude problem. None knew better the prerequisites of its solution: complete and accurate astronomical tables calculated for a standard meridian; exact subdivision of time to the second; instruments reading accurately to a second of the arc; and an accurate measurement of an arc of the meridian. Nevertheless his public utterances did not always correspond to his private scientific views. On several occasions he was asked to join committees of investigation of the claims of those who said they had "found the longitude." Among these was Henry Bond, a mathematical teacher and instrument maker, who as early as 1638 believed he had discovered the law of the secular variation of the compass needle, and hence could draw on the globe each year the magnetic latitudes and meridians. The latitudes, he believed, were indicated by the inclinatory or dip-needle, the meridians by the needle of variation. The basic idea was a very old one, and was not finally rejected until late in the eigtheenth century. The Royal Society was sufficiently interested to instruct Hooke (then their Curator of Experiments) to test Bond's supposed "law," and he made a carefully checked observation of the variation on the King's dial at Whitehall on 8 June 1665. It was another eight years however before Bond could find a patron ready to push his claims, which he did at last in the person of old Dr. John Pell, a friend of Gellibrand, the discoverer of the secular variation, and himself a dabbler in magnetic theory. Pell went first to Trinity House, and the matter was then referred to Admiral Sir Joseph Jordain, who recommended an official investigation. Hooke was summoned to join a committee with Pell, Seth Ward, and one or two officers of state, and Bond was received in audience by King Charles. This was in April 1674, when, according to Hooke's private diary: "Dr. Pell examined Bond's theory. He found it ignorant and false, but resolved to speak well of it." However Charles II left for Windsor before the committee had drawn up any report, and although he spoke of the matter once or twice to Seth Ward, the Bishop of Salisbury was unable to make the theory clear to him and the matter lapsed. Towards the

end of the year however a certain noblewoman brought to the King's notice a Frenchman, the Sieur de St. Pierre, who also claimed to have "found the longitude." The King set up a Commission of Inquiry in December, and among those appointed to serve upon it were the same men who had considered Henry Bond's claim. No one was very anxious to assist the Frenchman, and the first sitting was not until February 1675, when the Secretary of State insisted that something be done to relieve him of St. Pierre's daily importunities. The Committee met at the house of Colonel Titus, one of the Grooms of the Bedchamber, and as it transpired that the method concerned the moon's appulses to the fixed stars, young John Flamsteed, of Derby, whose lunar work had been attracting notice for some years, was by common consent added to their number. The data required by St. Pierre for a demonstration appear to have been furnished by Hooke, and when the Frenchman rushed round to Pell's lodgings before breakfast and without an interpreter, and angrily declared them to be false, absurd and useless, it is not impossible that he was speaking the truth, for the committee were clearly unfriendly. Meanwhile the members of the old Bond committee got together and made a report to the King advising him to make a grant of £30 for inclinatory needles, with which to test the magnetic theory at sea, and to give immediate monetary support to Bond himself. The members of the Committee stole a march upon Hooke on this occasion, for they arranged to go without him to the King's Privy Gallery at 8 o'clock on the morning of March 4, when Seth Ward and Titus went into the Bedchamber. Hooke was furious. "Titus a dog (he writes in his Diary), I should have been at the King's next morning with a report." Nevertheless what Hooke really thought of the method is contained in a letter which he wrote in 1679: "As for the invention of Mr. Bond for finding the longitude by the inclinatory [needle], I never looked upon it otherwise than as a fancy." He had, in fact, gone into the subject with some care, and shown some relevant experiments before the Royal Society. Bond did not live long after the publication of his method under the title of 'The Longitude Found,' and there is evidence that he found difficulty in getting payment of the pension of £50 which the King had assigned to him. No serious attempt seems to have been made to test his theory at sea.

Meanwhile the Sieur de St. Pierre gave the Secretary of State no rest, demanding that a new set of observations should be given to him to try his skill. This led to the drawing up of a formal report by Flamsteed, dated 26 April 1675, in which he pointed out the insuperable difficulties of the method in regard (*inter alia*) to the inaccuracy of existing lunar tables. It was a method already proposed by another English mathematical teacher, Thomas Streete, a friend of Hooke's and later of Halley's: the principle was sound enough, the observations and existing instruments alike were lacking in the necessary precision.

Many weeks before Flamsteed's actual report was presented Charles II had become convinced of the prime necessity of adequate astronomical tables if navigation was to be improved. Sir Jonas Moore had originally proposed himself to build Flamsteed an observatory, and Titus had introduced the young astronomer to the King early in February 1675, when Charles was informed of the important astronomical and geodetic work already com-

pleted by Picart and the French Academy. It was in fact on March 4, the day on which Titus and Bishop Ward took the Bond report into the Bedchamber, that Flamsteed was appointed Astronomer Royal, and a Royal Observatory promised him. Hooke learned of it two days later at Sir Jonas Moore's house, and on June 22 received instructions from Sir Christopher Wren "to direct observatory in Greenwich Park for Sir J. Moore." "He promised money," the Diary entry continues, that is to say, Hooke was to look for payment to Moore. He met Flamsteed the next day, and a week later (June 30) the two men, accompanied by young Halley (then about nineteen), went down to Greenwich Park. On July 2 all three met again at a coffee house, when Hooke reports: "I described Observatory," that is to say drew the plans. On July 28 the entry runs: "To Greenwich. Set out Observatory," and by August 10 building was begun, and Hooke was helping to supply the necessary instruments. Thus Greenwich Observatory is yet another of Hooke's architectural works commonly ascribed to Wren. The new Astronomer Royal and Hooke did not long remain friends: Flamsteed presently becomes "a conceited coxcomb," "conceited about nothing," "bragging of his great quadrant," and directly Sir Jonas Moore died, Hooke sent his two assistants, Hunt and Crawley, to fetch back all the instruments that he had lent the Observatory. "F. mad," he adds in his always revealing Diary.

To return however to the events of 1675. The general interest shown in the longitude problem turned Hooke's thoughts to his own spring watches once more, for talk of vast monetary rewards was again in the air. Sir James Shaen, Surveyor-General for Ireland, promised him an income for life of £150 in return for his invention, as well as £1000 in ready money. Hooke showed a watch to the King on April 7 and was promised a patent, being commanded at the same time "to prosecute the degree," *i.e.* to measure the arc of the meridian as Picart had so successfully done in France. A month or so later Mr. Lodowick, a Fellow of the Royal Society, affirmed to him that rewards amounting to over £3000 awaited the discoverer of longitude in the Netherlands, and during the rest of the year Hooke was improving his watches, working especially on the escapement. He summed up their peculiar features in a passage written in the Universal Language or "Real Character" invented by Bishop Wilkins, a passage which (as recently deciphered by Professor Andrade) runs as follows: "The contriving of the portable watches is comprehended [governed] as far as their regulation is concerned by two objects. The first is the causing of a counter effect to all gravity and motion, so as neither the pulling power of the Earth, nor position, nor irregular external motion of the watch can cause any irregularity." In a word, the defects of the pendulum clock were eliminated.

It was in the beginning of 1675 also that Isaac Newton paid several visits to Hooke, and the latter first tried to interest the Cambridge philosopher in cooperative observations of the kind that were being so successfully carried out in France by Römer, Picart, and de la Hire. But in France the Academicians were chosen and paid by the King (being brought from abroad if necessary), their tasks were assigned to them by the far-seeing Colbert, whereas there was no such directing force in England, and each man followed his own bent. The foreign correspondence, organized by Henry Oldenburg

as Secretary of the Royal Society, kept the French and English observers minutely in touch, although Colbert tried to limit the circulation of the published results of the work of the Academicians. It was for this reason that Picart's 'Mésure de la Terre' first reached England (late in 1671) in a transcript made by Francis Vernon, and that Hooke could not secure a copy until 1673. Not until 1676 were copies officially sent over by Colbert. When in September 1679 Hooke learned through M. Justel of the carefully organized scheme for establishing an astronomically determined framework of meridians for the map of France, he passed the information on to Newton and again expressed his wish that something of the sort should be done in England. But Newton was not responsive, although he is said to have promised his help when an actual scheme for a similar map of England was brought forward by John Adams rather more than a year later. There is no evidence however that he gave it.

This is not the place to enter into the question of Newton's indebtedness to Hooke, but it may be recalled that the latter read his paper on planetary motion to the Royal Society on 23 May 1666, when he put forward the hypothesis that it was compounded of motion in a straight line and motion towards the centre due to "a supervening attractive principle." "By this Hypothesis," he adds, "the Phaenomena of the Comets as well as of the Planets may be solved, and the motions of the secondary as well as the primary planets." That the attraction towards the centre varied inversely as the square of the distance was also suggested by Hooke. "The weights or powers of gravity (so runs his note) are as the Reciprocalls of the squares of the distances," and "The planetary elliptical motion is compounded of this and equal lation [*i.e.* translation]." He was the first to admit that it was Newton who gave rigid mathematical proof of these hypotheses, but his priority of suggestion demanded some acknowledgement which it did not receive. In his Diary for 15 February 1689 he writes: "At Halley's met Newton. Vainly pretended claim, yet acknowledged my information. Interest has no conscience." This was about eighteen months after the publication of the 'Principia.'

It was because Hooke believed that gravity was a function of distance between the centres of the attracting bodies that he made his weighing experiments on the summits of high buildings (including the Monument, which it was he who designed, not Wren) and down deep wells on Banstead Downs when he was staying at Durdans during the Plague. But he realized that these distances were too trifling, and hence eagerly awaited the results of Halley's observations on the pendulum in St. Helena, where the height of the observing station was 3000 feet. Halley returned in 1678, and in writing to Newton about combined motion in the New Year of 1680, Hooke says: "Mr. Halley when he returned from St. Helena told me that his pendulum at the top of the hill went slower than at the bottom, which he was much surprised at, and could not imagine a reason. But I presently told him he had solved me a query I had long desired to be answered, but wanted opportunity, and that was to know whether the gravity did actually decrease at a greater height from the centre. To examine this decrease of attraction I have formerly made many experiments on Paul's Steeple (*i.e.* before the Great Fire) and Westminster Abbey, but none that were fully satisfactory. This will spoil the universal

standard by the pendulum, and the equality of clocks carried from one climate (*i.e.* latitude) to another. And many other consequences will follow of which I long since gave the Society an account."

One of the immediate results of the establishment by Huygens of the relationship between the period and the length of the pendulum had been the proposal of the seconds pendulum as a universal measure or standard of length. Bishop Wilkins, Sir William Petty, and Sir Christopher Wren were among its advocates, but as early as 1664 Hooke argued strongly against it, on the grounds that there was no proof that gravity, which entered into the formula, was constant either in time or place. "In all circular motion," runs one of his notes preserved in the Royal Society's Library, "the endeavour of receding from the centre is as a duplicate proportion of the velocity," and the idle pencil scribbles on this note of a globe flattened to a spheroid hint at the direction his thoughts were taking. In fact long before the publication of Newton's 'Principia,' Hooke was firmly convinced of the spheroidal figure of the Earth, and of the variation of gravity with latitude, as is borne out by his statement already quoted relative to the elimination of gravity in his spring watch. His view was strikingly confirmed in 1672 by Richer's observations in Cayenne (Guiana), although strangely enough Picart refused to recognize their significance, and explained the variation as due to temperature conditions. In subsequent years other French observers were sent into low latitudes, and in February 1683 Mariotte wrote to the secretary of the Royal Society that since they had confirmed Richer's results it was very desirable that observations should be made in high latitudes, for example in Spitsbergen, which was visited by English whale fishers. A long correspondence and discussion followed, and Flamsteed was among those who mistakenly assigned the variation in the period of the pendulum to the difference of atmospheric conditions in high and low latitudes.

Hooke thereupon prepared two lectures on the subject of "The Improvement of Navigation," in which he reiterated his opinion that a knowledge of the exact shape and size of the Earth was fundamental. Nearly twenty years earlier he had pointed out that a standard measure of length was best defined in terms of the Earth's diameter. A standard cut in metal or glass or any other material was likely in the long run to decay, a measurement made between two fixed points on the surface of the Earth might be vitiated by topographic change. A standard based on the size of the Earth had three advantages: no measurement was less likely to vary, it could be found again if lost, it could be determined in any part of the world. Such a standard, as is well known, was adopted in France in the eighteenth century, and might have been adopted sooner had not Colbert's death in 1683 postponed J. D. Cassini's plan for extending northwards and southwards over 7°–8° of latitude the triangulation on which Picart's measurement of the arc of the meridian was based. News of this plan reached England a month after Hooke had delivered his lectures, in the course of which he had observed that the oval figure of the Earth had not yet been actually proved, and that though Picart's and Norwood's figures of the length of an arc of 1° agreed fairly closely, further observations ought to be made in other latitudes and azimuths. That a spheroidal Earth would not so readily yield a standard of length did not, of

course, escape him. As might be expected from his interest in the subject, Hooke himself had long planned to make measurements of the circumference of the Earth. The method he proposed was to make very refined "perpendicular observations" at two points a mile apart, but although he made many notes on the subject, he decided that with the means and instruments at his disposal he could not hope to improve on Picart's figures. Moreover, the latter's observations made at Uraniborg in 1671–72 had cast a doubt on the stability of the Earth's axis, and hence on the invariability of latitude and longitude and of the direction of the meridian.

Hooke made good use of this last point in his speculations upon the history of the Earth, which he formulated in a lecture delivered in 1689. All his life he had been observant of fossils and of earthquake and volcanic phenomena, and his work as one of the City surveyors had made him familiar with the sequence of sedimentary deposits beneath London and with the processes of erosion and deposition. He adopted Aristotle's view, that mountains might become plains, and plains mountains: the Earth's crust was not stable, as both earthquakes and volcanoes plainly indicated. Any change in the velocity or axis of the Earth's rotation would alter the distribution of gravity, leading to a redistribution of land and water, and to a sliding, sinking, and changing of the interior and exterior parts, such as the present disposition of the rocks revealed. Throughout England "not only the vales and lower parts of the land have sometimes been at the bottom of the sea, but even the tops of the hills and mountains": a thesis he had maintained as early as 1663. Dr. John Wallis took great offence at these views, and attacked Hooke for supposing the world "turned upside down." A physician of good credit, he declared, had taken a fish shell out of a woman's kidney, and did Hooke suppose that the sea was once in her kidney, as he supposed it was once on the summit of the Alps where fossil shells were to be seen? The shell probably dropped out of the doctor's sponge, was Hooke's retort, and anyhow the argument was irrelevant. "And when he can certainly tell me how old the world is, I will tell him probably when such changes as I have mentioned may have happened." Here we may notice that John Beaumont's very enlightened 'Considerations' on Dr. Thomas Burnet's hotly debated 'Theory of Earth' was dedicated to Hooke, while Whiston's 'New Theory,' which supposed that the Earth only commenced to rotate after the Fall, and that the Deluge was due to its passage through a comet's tail was dedicated to Sir Isaac Newton.

Burnet, like Whiston, postulated a violent break in the natural order at the time of the Deluge. His antediluvian World was egg-shaped, and perfectly smooth, without either mountains or ocean basins; the waters were then all gathered beneath the crust, and it was their bursting forth that flooded the earth. Hooke, on the other hand, was a pioneer of Uniformitarianism: he sought first to explain the past in terms of facts and processes to be observed in the present. Against the overwhelming majority of his contemporaries (and even his fellow scientists) who believed that fossils were merely fancifully shaped stones, he maintained and demonstrated their organic origin, although this led him to the then novel conclusion that there were extinct species of animals, represented, for example, by the giant ammonites to be seen in the Jurassic limestones. Marine fossils meant marine transgression, and even

then (as he puts it) "obliging himself to follow the words and discourse of Moses," that is to say, keeping to the Bible narrative, Hooke could find an explanation of the Universal Flood in the rising of the sea-floor and the subsidence of the land-surface, without demanding any unprecedented event such as waters bursting through the crust or falling from a comet or from another planet. Again, the supposed longevity of antediluvian humanity could be more simply explained in terms of a different unit of time, that is to say a more rapidly rotating earth, than as due to a fundamental change in man's characteristics. He revealed his mind even more clearly in a Discourse of 9 January 1689, when (once more a pioneer) he put forward the thesis that the design of Scripture was not to teach natural philosophy but to show the wisdom and power of God, and hence that the biblical account of Creation, being adapted to the common apprehensions of mankind, was not to be read literally, or used to refute the results of scientific experiment and observation. His retort to Dr. Wallis, already quoted, suggests that Hooke did not consider himself bound by Bishop Usher's chronology, but, of course, it cannot be claimed that he anticipated modern discovery of the order of age of the Earth in hundreds of millions of years.

Mention has been made of Hooke's work as a surveyor, which dated from the Great Fire of London. It turned his attention to cartography, and he took part in the preparation of Ogilby and Morgan's great "Map of London"; he spent months of strenuous work upon Moses Pitt's "English Atlas," and he was adviser to John Adams, whose great survey of England and Wales (based on a triangulation) was interrupted by poverty and illness and by the absence of support for such work in the troubled times subsequent to 1685. His contribution to regional geography took the form of questionnaires, drawn up for the use of travellers and seamen, and in his Introduction to Captain Knox's book on Ceylon, published in 1681, he points out that most travellers need the help of such queries before they can know what to observe, as well as help in arranging and digesting their material for publication. It is interesting to remark that one of his questionnaires, obtained by Frederick Marten from the Royal Society, played its part in the genesis of the first book to be published on Spitsbergen, a part of the world in which the Royal Geographical Society interests itself to-day. An English version of Marten's work appeared in the anonymous collection known as 'Narborough's Voyages,' a collection in which Hooke may also prove to have had a hand. He was a very diligent translator, as his Diary shows, and besides reading innumerable contemporary voyages and travels, he was familiar with the great collections of Hakluyt and Purchas.

A pioneer in oceanographical research, Hooke was also the first to realize that the rise and fall of the barometer allowed of weather prediction, and hence he devised a barometer for use at sea, where such predictions were of vital importance. He drew up a well-thought-out scheme of daily weather observations, including a classification of clouds, and made both practical and theoretical contributions to meteorology. His complicated self-recording weather-clock was but one of many hundreds of new instruments which he devised, and he is probably correct in estimating his inventions of all kinds at nearly one thousand. A large body of his work as an architect and on the

microscope had no relation to geography, and it was because he refused to canalize his energies that he was constantly outdistanced in particular directions, here by a Flamsteed, there by a Halley, there again by a Newton. He took all science for his province, and what his contemporaries expected of him may be judged from the list of thirty-eight "Experiments and Observations recommended to Mr. Hooke" to be carried out in the latter part of the year 1666. These included: To try the celerity of falling bodies. To bring a description of Mr. Boyle's pneumatic engine. To continue his observations of the satellites of Jupiter. To try how the spirits of sensitive plants differ from those of ordinary ones. To fit two rules of wood on Prince Rupert's Perspective Instrument as 'tis improved by Mr. Hooke, instead of the threads that do direct the parallelism. To reduce water into ice without blobbs. To consider of a cheap engine to strike whales. To make observations on fish spawn. To take care of the diving experiments. To endeavour to produce a way of softening steel. To perfect his new Quadrant. To give in writing his experiments made to explicate the inflexion of direct motion into a curve by a supravening attractive principle. To observe the parallax of the Earth's orb to seconds. To perfect the springy saddle upon two wheels. To make celestial observations corresponding to those made by the Earl of Sandwich in Spain: by observing the Moon's visible way among the fixt Stars. To publish his observations and discourses of the comet of 1664. To perfect his new watch and bring in the description. And finally, To measure the circumference of the Earth to seconds by a 60-foot glass, put perpendicular, a place being given where the distance may be correctly measured, such an one as may be smooth and a mile long, lying north and south, or at least north-east and south-west. This last, with another experiment, was to be brought to the Society on 23 January 1667. That it was never completed we can hardly be surprised! As the records of the Royal Society show, Hooke was alternately ordered and reminded to "measure the degree" more than a dozen times, until, in fact, Picart's figures were made known.

What then should be Hooke's place among the founders of science? Certainly he has never received full justice. Too much has been made of his jealous temper, and his constant claims to priority of invention. John Collins declared for example, that on first hearing of Newton's new reflecting telescope, "Mr Hooke . . . affirmed *coram multis* that in the year 1664 he made a little tube of about an inch long to put in his fob, which performs more than any telescope of 50 feet long made after the common manner; but the plague happening which caused his absence, and the Fire, whence redounded profitable employments about the city, he neglected to prosecute the same, being unwilling the glass-grinders should know anything of the secret." But such outbursts were purely temperamental. Hooke was fundamentally generous, as appears by his readiness to help both Flamsteed and Halley when they were young men, as well as by his kindness to Ogilby, and equally in his eulogy of one with whom he was long and closely associated, Sir Christopher Wren. "Since the time of Archimedes (he wrote) there scarce ever met in one Man in so great a Perfection, such a mechanical hand and so philosophical a mind." This was his ideal of the man of science: one in whom experiment and speculation were equally matched. He realized, perhaps more clearly than any of his

contemporaries, how little had actually been proved by experiment, how much awaited investigation. It was from this standpoint that he warned his hearers most strongly against the danger to natural philosophy of preconceived ideas. Had we any warrant for supposing the Earth's diurnal motion uniform? he asked. Was the meridian invariable? Was the globe shrinking and becoming more compact with age? And in relation to this last question, Hooke speculates as to whether we have not here an explanation of mountains and valleys as the wrinkles on the now loosely fitting crust. Yet another question: was the common assumption correct that gravity acted everywhere "towards the centre"? Here he suggests means of putting the doubt to the test of experiment. "The best way that I know how to prove it is to measure the parts of a meridian upon the Earth from pole to pole, and compare them with celestial meridianal altitudes, for if they everywhere correspond and answer one another, then the perpendicular line is true in all those places, but otherwise not. And till this be done, we are not by any certain experiment assured that the body of the Earth itself is perfectly globular." He is laying down the principle, in fact, of the geodetic and astronomical methods of survey respectively which form the basis of modern measurement of the geoid.

But not only had Hooke a mastery of the method of science; he had also a clear vision of its purpose. Where Sir Isaac Newton "to avoid being baited by little smatterers in mathematics," as he declared, designedly made his 'Principia' abstruse and obscure, Hooke laid it down that "a mechanic invention" was the more useful the simpler it was and the more easy to be understood. Research had for him always a practical aim. His study of map projections was directed solely to the problem of plotting and measuring the rhumb-line and the great circle in such a way as to facilitate navigation by dead reckoning. And navigation in its turn was a means to an end—knowledge of the geography of the world.

Upon "The Business of Philosophy" Hooke wrote as follows: "Knowledge is not barely acquired for itself, but in order to the enabling of Man to understand how . . . he may be able to produce and bring to pass such effects as may very much conduce to his well-being in this world, both for satisfying his desires and relieving his necessities." Or to reclothe Hooke's thought in the language of a modern scientist, "Principles of science are more or less important because they have affected the social practice of mankind directly or indirectly to a greater or lesser extent." And hence it should be the object of the scientist as teacher "to give the citizens of to-morrow a vision of what human life could be if the treasury of scientific knowledge were dedicated to the satisfaction of human needs."

[*Note on Sources.*—A considerable body of material relating to Robert Hooke has been brought together by Dr. R. T. Gunther in his 'Early Science at Oxford' series of publications, while an important 'Diary' has been edited by Mr. Robinson, Librarian of the Royal Society. In addition, the 'Posthumous Papers' edited by Richard Waller have been drawn upon, together with manuscript material in the archives of the Royal Society and at the British Museum.]

DISCUSSION

Before the paper the CHAIRMAN (Col. Sir CHARLES CLOSE) said: Professor Taylor needs no introduction to an audience of geographers. Every now and then she digs up some old geographer and finds out what he has done, the methods he used and the results he obtained. In this case, she has dug up a very distinguished man, Robert Hooke, who has been described as a peevish genius, very irritable, but one who spread his knowledge over an immensely wide field. Amongst other things he dabbled in the question of the determination of longitude; the question of the variation of the forces of gravity over the Earth's surface; the use of telescopic sights, and many other technical matters which are of interest to geographers. But I must not anticipate Professor Taylor's lecture. I ask her if she will now kindly deliver it.

Professor Taylor then delivered the lecture printed above, and a discussion followed.

Dr. H. R. MILL: I am very glad to have had this opportunity of hearing Professor Taylor, because she had the power of making full of human interest the work of a man who has hitherto been rather looked upon as one of the dry-as-dust mechanical geniuses who were always planning things and doing things, and saying that other people were not doing them the right way.

I particularly appreciate the way in which Professor Taylor has shown how this many-sided man devoted more than one of the aspects of his intelligence to the physical study of the Earth. He lived in a period when the world was opening up on all sides and the names of his contemporaries are enough to show how there were possibilities in every direction which were being taken advantage of. Plans were being made which might have left us in a much happier position than we are in to-day. The great geographical project of Christopher Wren, to replan London after the Great Fire and lay out the city with broad streets, which would almost have been suited for modern motor traffic, is a case in point. Was that, I wonder, one of the ideas Hooke initiated?

Professor Taylor knows so much about the scientific work of the sixteenth and seventeenth centuries and has done so much in the way of bringing back to our knowledge the pioneer geographers of that period that it would be impertinent for any one who knows only the little that has gradually filtered in from miscellaneous reading to offer any sort of criticism. Certainly I have no desire to question her estimate of the various qualities and the relative importance of those formidable philosophers. I think that though Professor Taylor left the portrait of Isaac Newton longest upon the screen, she did not do so because she viewed him as the greatest. Even he, I gather, absorbed ideas that Hooke had in his mind beforehand.

We are very much indebted to Professor Taylor for a delightful lecture, which has made Hooke's character and work even more fascinating as a human study than many of his old admirers, amongst whom I range myself, had thought.

Dr. R. T. GUNTHER: It is with a great feeling of humility that I come before you this afternoon to say a few words on the wonderful picture that Professor Taylor has given us of the personality and life-work of Robert Hooke. Only a short time ago I attended a meeting of a medical society at which the subject for discussion was "The Medical Work of Robert Hooke." It was there pointed out how he had been an early pioneer in the operation of introducing fluids into the blood-stream and that he was regarded as one of the parents of the operation of transfusion. I mention that as a side issue, as showing just one of the many subjects with which Hooke dealt.

Hooke was always trying to improve the instruments by which men of science become better acquainted with the Universe. I wish to stress that point at the present moment because I have had the good fortune within the last two or three months of being able to put together in Oxford some of the large observatory instruments which must have been perfectly well known to Hooke, and with which he and Wren and others must have worked before he published his improvements. For many years the existence of these things has been unknown. They had been put away behind some bookcases in the University Observatory; we do not know how they came to be stowed there. Last summer our new Professor of Astronomy had cause to remove the bookcases and found behind them what he described as "old metal," some much corroded bars of bronze and one iron instrument in particular. He was kind enough to hand the things over to me. I had them cleaned, and then discovered inscriptions upon them which proved that they were given by Nicholas Greaves to the University in 1659, the year in which Wren was appointed Savilian Professor at Oxford. Actually, the instruments go back long before that time. There was a fine astrolabe made for Queen Elizabeth by Gemini. One of the most important, a large quadrant of 7 feet radius, was made by that accomplished instrument maker, Elias Allen, and is dated 1637. In 1637 Bainbridge was our professor of astronomy and it was given to the University in memory of him and of John Greaves, who was his successor. But I cannot help thinking that Wren's appointment to the Savilian Chair in Oxford in 1659 may have had something to do with this gift to the University.

The importance of this quadrant is that the scale on the limb is graduated as a diagonal scale to read to single minutes. Hooke was at work in Oxford about that time and he must have been acquainted with the Savilian Observatory and seen that astronomers were craving for more accurate methods of subdividing the degree, and with that in mind no doubt he constructed the instrument of which Professor Taylor put a diagram on the screen.

Another instrument of considerable oceanographic interest was his Sounding apparatus. As you know, when Lord Kelvin described his patent, the deep-sea sounding machine, he availed himself of the principle that when air in a vessel is let down into deep water, the volume of the air decreases in proportion to the depth that is reached—in proportion to the pressure of the water upon it. In Lord Kelvin's sounding apparatus, which was arranged on that principle, the inside of the glass tube in which the air was kept was painted with some chemical which altered its colour or visibility as sea-water reached it. As the tube was let down into the water, the sea-water rose in proportion to the depth to which the apparatus went. By means of the discoloration produced the observer was able to decide the depth reached. Hooke was not a chemist and did not know anything about that part of the business, but he was acquainted with the fact that gaseous volumes change proportionately to pressure, so he invented a deep-sea sounding arrangement which consisted of a large bulb about 16 inches long, with one end turned down. That instrument was let down into the sea vertically, and when it was taken up, all the observer had to do was to measure the quantity of water that had entered the bulb and deduce the change of pressure.

I should like to allude to one or two points in Professor Taylor's paper. She says that Hooke came of yeoman stock. I would like to know more about Hooke's ancestry than I do at present. About six months ago I paid a visit to Freshwater in the Isle of Wight on a pilgrimage to Hooke's native village. I was pleased to see a window to his memory and that they still have the register recording his birth as the son of the Rev. John Hooke, Vicar of Freshwater.

I am not sure if anything more is known. I believe his mother's name was Mary, but what the ancestry of the Rev. John Hooke was, as far as I am aware, is not known. That is one of the matters upon which we very much desire the help of genealogists. A house near the Vicarage is called Hooke Hill, and that is where he may have lived.

With regard to Hooke's alleged quarrelsome character, I cannot help thinking Professor Taylor has given a full explanation of that. Hooke was always being pestered by his fellow-members of the Royal Society. He would be doing one thing in his laboratory, and there would be a stream of people putting stupid questions, or asking him to do something other than the work on which he was engaged. That, I think, was sufficient to interfere very seriously with the temper of a man who was not always in good health, and in fact Hooke was often in very bad health. He did not quarrel with his Oxford friends, Boyle, Wren, and others.

Hooke's work was so extensive that one might go on talking about him for ever, but before I sit down I should like to compare his idea of a physical or mathematical laboratory with that which was afterwards expressed by Charles Dodgson of Oxford, better known as Lewis Carroll. In one of his humorous writings he said that the University ought to have a mathematical laboratory, and that connected with this, there ought to be a tract of land railed off for the investigation of the properties of parallel lines, and that for this purpose it should extend "ever so far." And that, I think, nearly corresponds to Hooke's idea of "a place being given where the distance may be correctly measured, such a one as may be smooth and a mile long."

Mr. J. N. L. BAKER: I feel somewhat of an impostor here because I am in no sense a specialist in the subject of the paper. There are, however, two points which I would like to raise.

I was a little disappointed that Professor Taylor did not say more about Hooke's early career at Oxford because I think that is important. Hooke went up to Christ Church in 1653, a year after John Locke went to Christ Church, and four years after Seth Ward became Savilian Professor at Oxford. Seth Ward was Professor of Astronomy, and the Statutes of the University laid down that the professor of astronomy should teach what was then called cosmography, which included a number of the matters which Hooke investigated. Both Hooke and Locke were pupils of Ward's, that is to say, they attended Ward's lectures which, we are told, were both good and successful. It is impossible to say how much either Hooke or Locke derived from them, but in estimating Hooke's subsequent achievements it would perhaps be fair if we paid some tribute to those who guided his footsteps in his early days at Oxford.

Then I would like to ask two questions arising out of the paper. Professor Taylor referred to what we may call the geomorphological ideas of Hooke. In 1625 Nathanael Carpenter, who was also an Oxford geographer, included in his Geography a small section dealing with geomorphology, to use a modern term, and he says that he got it from a German geographer named Blancanus, who had produced a work about five years earlier. I have not been able to get hold of a copy of this work and have never seen any account of it. I would like to know whether Professor Taylor has compared Hooke's views on these matters with those expressed in these earlier works.

At the end of her paper Professor Taylor referred to another interesting point in connection with Hooke: the list of questions he drew up for people who were going to travel. Boyle did exactly the same thing. Boyle says that he was subjected to such frequent importunities by the new searchers after knowledge

that in order to meet their requirements he wrote a small pamphlet which he called "General heads for the natural history of a country, great or small." In that little pamphlet he gave general advice as to what people should look for. I have not been able to see a first edition of that work; I do not even know that there was, strictly speaking, a first edition. The only copy I have seen is one which is said to have been revised, enlarged, and published by a friend. It was not published until 1692, which is some time after Hooke's work. I do not know if Hooke owed anything to Boyle, or if Boyle borrowed from Hooke, but the production of two similar works is of interest and I think shows, to some extent, that Hooke was very much what we might call a product of his period.

Professor TAYLOR, in replying, said: You will notice that each of the speakers has mentioned that I left out some whole subject regarding Hooke. Had I gone into every point you would have been here till this time next week.

As to Hooke's plan of London, he drew a plan which pleased the City fathers better than those drawn by more important persons, and because of that plan he was given his job as city surveyor, which brought him in a great deal of money.

The subject of his instruments is a huge one, on which I know Dr. Gunther, as Keeper of that wonderful collection of instruments at Oxford, is an expert. There again, not only from the point of view of time, but of modesty, I kept silent.

I had meant to say something about Seth Ward's relation to young Hooke, but once more I was prevented from lack of time, and I have not gone very thoroughly into the question of exactly what Hooke got from Seth Ward. Although I know from the very earliest work Hooke published (a little work on capillarity which he was put on to by Robert Boyle), that he was a reader of the standard geographies of his time, which included Carpenter. I cannot say whether he was a reader of Blancanus, and I have not compared his views with those of Nathanael Carpenter. Nor have I gone thoroughly into the details of his questionnaires and compared them with those which came out under other people's names. It was common at that time for a great man to work with lesser men. One constantly finds Hooke associated with a man like Wren, who gets credit for Hooke's architecture; or with Moray or Boyle. It is possible that Boyle's questionnaires do bear a close relation with those of Hooke, but not quite in the way Mr. Baker has suggested.

Professor KENNETH MASON: The Chairman had to leave early and asked me to bring the debate to a conclusion. I am not at all competent to speak about any of the great men of the past to whom reference has been made. You have heard experts on the subject, and I will ask you now to give a hearty vote of thanks to Professor Taylor and to those other speakers who came and helped in the discussion.

THE SINHARAJA RAIN-FOREST, CEYLON

JOHN R. BAKER

BEFORE the Sinhalese first came to Ceylon, the whole of the south-west of the island (the low-country wet-zone) was probably covered by tropical rain-forest. The Sinhalese are accustomed to cut down virgin forest, grow a single crop on the *chena* so prepared, and thereafter leave it as waste land for an indefinite period. The result has been that there is little primeval forest left in regions where the population is fairly high, except for small patches in places which are not convenient for cultivation. Great areas of forest exist in the dry zone, on account of the population being relatively small there; but this forest is not rain-forest, and it is not certain that it is actually virgin forest, for the land may have been cultivated in the far-distant past, when the population was much greater and the innumerable tanks in use. The only considerable patch of virgin tropical rain-forest in the island is the Sinharaja Forest. The name means Lion King and is pronounced Singhā-rā-jā. Another considerable tract of evergreen forest exists in the neighbourhood of Adam's Peak, and is often spoken of as the "Wilderness"; but this is at too great an elevation to present the characters of a tropical rain-forest.

The Sinharaja is mentioned by certain authors. Thus Willis,[1] writing of the low-country wet-zone, says: "It was, there can be little doubt, once entirely, or almost entirely, covered with a sheet of dense forest, but of this only portions now remain, as for instance the Singha Raja forest to the south of Ratnapura." Of the same region Charawanamuttu [2] says: "The forests have for the most part been cleared for rubber cultivation. But here and there dense forests still exist—Sinha Raja forest between Sabaragamuwa and Western Provinces." Lewis [3] says: "Of the large forests still remaining, we have the Sinha Raja extending in a very broken form through the Pasdun Korale in the Kalutara District into the Kukulu Korale in Sabaragamuwa. . . ."

It is a strange fact that the Sinharaja Forest is not marked on any map that is known to me. I therefore decided to find exactly where it is and to make a general study of it. For this purpose I camped in its vicinity from the end of July to the beginning of September 1936, and visited nearly every part.

I wish to express my indebtedness to Mr. A. B. Lushington and Mr. W. M. McNeill (of the Forestry Department), Mr. R. F. Lushington, and Mr. N. J. Luddington (Government Agent of Sabaragamuwa), all of whom gave me very valuable advice. Mr. T. B. Worthington stayed with me during the first two nights at my forest camp, and helped to choose the site for the meteorological station. Mr. J. C. de Alwis Wickremesekera acted as my interpreter and did meteorological readings while I was away from the base camp on expeditions to explore the forest.

[1] Willis, J. C., 1907. 'Ceylon: A handbook for the resident and traveller.' Colombo.

[2] Charawanamuttu, V. E., 1930. 'The new school geography of Ceylon,' 2nd Edit. Colombo.

[3] Lewis, F., 1902. 'A descriptive catalogue of the more useful trees and flowering plants of the Western and Sabaragamuwa Provinces of Ceylon.' Colombo.

Geography

The locality has been well mapped from a topographical point of view, mostly by Ceylonese surveyors, but there is nothing in the official maps (not even in the vegetation map) to show that there is a large area of virgin rain-forest in this particular place. By the use of a compass and aneroid barometer it was not difficult to draw the outline of the forest in the 1-inch map sufficiently accurately to show where the forest is and to give some concept of its size.

The position of the forest in the island is shown in Fig. 1. On the coloured

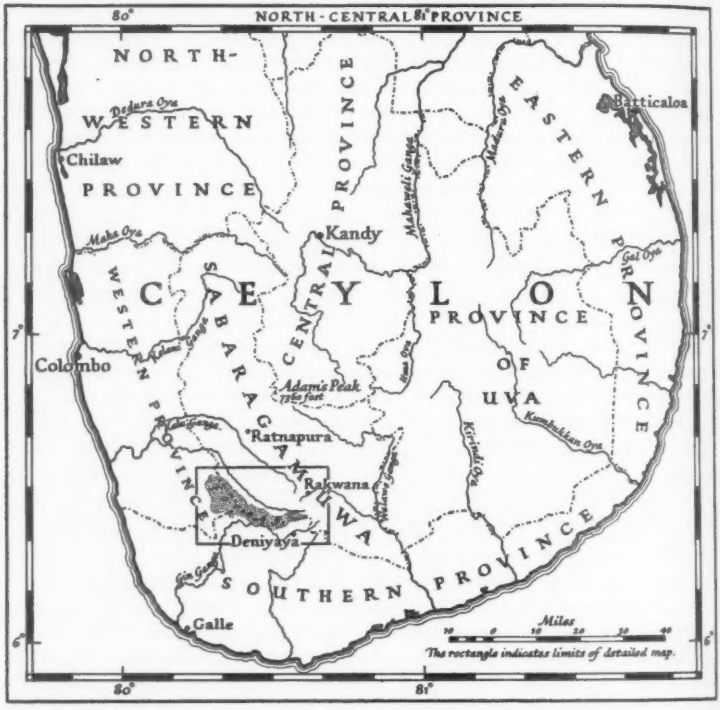


Fig. 1. Ceylon, showing position of Sinharaja Forest

map the continuous line represents the edge of the forest where I have seen it. I did not have time to visit its extreme ends, and the dotted lines indicate where the boundaries must be, according to information given by the natives. Many natives insist that the eastern end of the forest is the mountain called Gongala; but it must be so very narrow between the deserted coffee estates of this region that its limit is probably better indicated where I have put it on the map.

The Kalu Ganga and the Gin Ganga are fairly large rivers reaching the sea near the southern end of the west coast of Ceylon. The former has a southerly branch, the Kukulu Ganga. The forest is situated about the water-

shed between the latter and the Gin Ganga. It covers the southern edge of the parallel-ridge region of the Province of Sabaragamuwa, and extends also across the boundaries into the Southern and Western Provinces. The situation gives remoteness, for there are few villages within the forest, and it is never necessary for Government officers to travel through it. The passage of the Ceylonese surveyors some fifteen years ago is well remembered in the remote parts as a remarkable incursion from the outside world; and in some of the villages (*e.g.* Pitakele) the inhabitants insisted that no European had ever been there before myself.

The forest is south of Ratnapura and about 12 miles away at the nearest point. It is south-west of Rakwana and north-west of Deniyaya. It may be approached by motoring from Ratnapura past Kalawana to the ferry over the Koswatte River, whence one must walk. It is not difficult to obtain carriers. The forest is about 26 miles long and some 90 square miles in area. It extends from less than 300 feet above sea-level near Tiniyawala to 3838 feet at the summit of Mount Rupahinkanda, near its eastern end.

It is important not to confuse the Sinharaja Forest with the Sinharaja Forest Reserve. The latter is a very much smaller area of land, situated wholly in the Southern Province, and comprising a small part of the Sinharaja Forest together with a certain amount of *chena*. Other parts of the forest have received such names as "Delgodamukulana," etc., which simply mean the primeval forest (*mukulana*) of the particular locality named; but these are only local names for special parts of the Sinharaja. At certain places the local inhabitants will emphatically deny that the local forest is part of the Sinharaja, although it is obviously primeval forest and directly continuous with the rest. Natives of other parts will say that such places are certainly parts of the Sinharaja. The explanation is curious: the local natives are frightened that if they admit that their forest is a part of the Sinharaja, it will be claimed by the Government as a reserve, in which felling for *chena*-cultivation would be illegal.

Geology

The region of the Sinharaja agrees with much of the south-west part of Ceylon in that the rock is charnockite. This term indicates an igneous rock which was intruded into the Archaean gneisses and schists that compose the greater part of the island.[1] Dr. G. F. Claringbull identifies my specimen, taken from near the meteorological station, as norite. This is a basic charnockite consisting principally of plagioclase felspar, hypersthene, and magnetite. Thick slabs of mica (muscovite), some inches across, are found here and there in the ground. The soil is a dark brown, which contrasts with the reddish colour so frequent in the island.

Meteorology

The forest extends in altitude from under 300 to 3838 feet, and therefore there is a considerable difference in temperature in different parts. I put my meteorological station in the forest at a medium elevation, namely 1900 feet, near the watershed between the Kukulu Ganga and the Gin Ganga, at

[1] Coates, J. S., 1935. "The geology of Ceylon." *Ceylon Journ. Sci.*, B, 19, p. 101.

a place where the vegetation appeared to Mr. Worthington and me to be typical of a wide area. The situation was on ground sloping down to the north, about 1½ miles to the south of the village of Hapugoda (near Panapola). In order to avoid the possibility of proximity to the edge of the forest influencing the instruments, I put the station 400 yards from the edge at the closest place, although this entailed an hour and a half's difficult walking every day to get there and back twice from the camp. The readings were made every day during August. The instruments, most of which were kindly lent by the Oxford University Exploration Club, were the following: Maximum and minimum thermometers in a single-louvred screen (at the standard height of a Stevenson screen), attached to a tree; a grass minimum thermometer; a ground thermometer (with the bulb at 30 cm. below the surface of the ground); a katathermometer suspended from a wire between two trees (with the bulb 1 metre above the ground); a whirling hygrometer; a recording thermohygrograph (at the same height as the maximum and minimum thermometers, and protected only by a small piece of thatch directly above it); and a Zeiss "Helios" photo-electric cell. The arrangement of the station was in general the same as that of the forest meteorological station in a previous investigation in the rain-forest of the New Hebrides.[1]

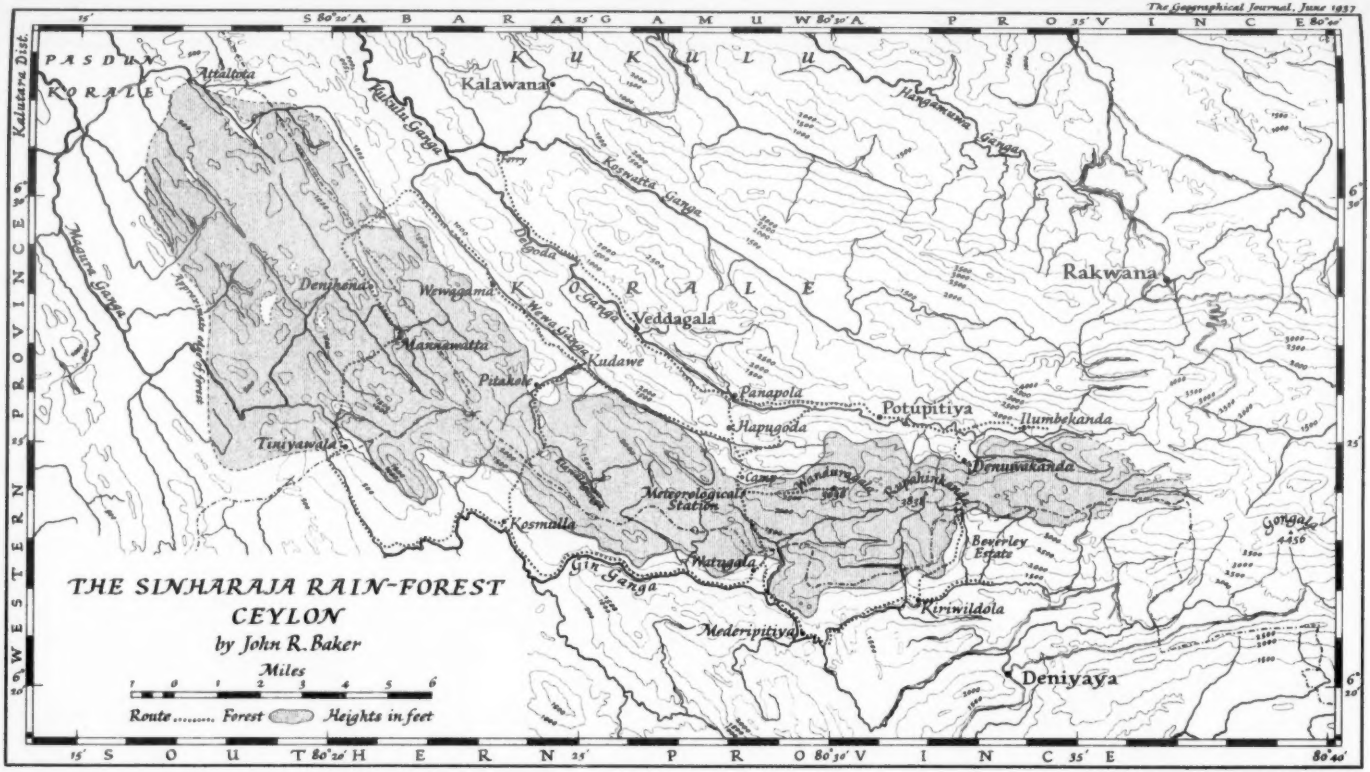
No previous information is available as to the climate of the Sinharaja, but Beverley Estate adjoins the forest near its eastern end, on the Gin Ganga side of the watershed, and Mr. J. L. Martin has most kindly put all his temperature and rainfall records at my disposal. I have made full use of them in what follows. Mr. Martin's station is at 2150 feet and of course not actually within the forest. He has records of daily maxima and minima from May 1934 to September 1936, and rainfall records for 1925–36 inclusive.

A full analysis of the available information is given in Appendices I–III. The following is a condensed account.

The mean monthly temperature at 2150 feet is at a minimum in January (22·9° C.=73·2° F.) and at a maximum (24·7° C.=76·5° F.) in April. It subsequently falls and rises to a high figure again, which is maintained from August to November. A difference of only 1·8° C. (3·2° F.) between the mean temperatures of the hottest and coldest months is a remarkably small one, even smaller than at Hog Harbour, New Hebrides, where it is 2·4° C. In the forest at 1900 feet in August, the thermometer rises to an average daily maximum of 24·6° C. (76·3° F.) and sinks to an average minimum of 20·6° C. (69·1° F.). The maximum is reached on the average at about 1.30 p.m., and the minimum about 6 a.m. The daily range of temperature in this forest in August was thus 4·0° C., which, remarkably enough, is only 0·1° C. different from that in the corresponding month (February) in the forest at Hog Harbour. It is clear that almost no heat is lost by radiation from the ground at night, for the grass minimum was on the average only 0·1° C. lower than the minimum within the screen. The ground maintains an extraordinarily unvarying temperature. The highest figure throughout the month was 21·8° C. and the lowest 21·6°.

The cooling power of the atmosphere was measured by katathermometer.

[1] Baker, J. R., and Harrisson, T. H., 1936. "The seasons in a tropical rain-forest (New Hebrides), Part 1, Meteorology." *Journ. Linn. Soc.*, Zool., vol. 39, p. 443.


THE SINHARAJA RAIN-FOREST
CEYLON
by John R. Baker
Miles
Route ..... Forest Heights in feet
WESTERN PROVINCE
SOUTHERN PROVINCE
SABARAGAMUWA PROVINCE
KUKULU KORALE
PASDUN KORALE
Kalawana
Attalotta
Kalutara Dist.
Kalutara Ganga
Kosmulla Ganga
Gin Ganga
Kudawe
Pitakele
Tiniyawala
Kosmulla
Meteorological Station
Camp
Veddagala
Rakwana
Panapola
Potupitiya
Ilumbekanda
Hapugoda
Denunukanda
Beverley Estate
Gongala
4456
Kiriwildola
Mederipitiya
Deniyaya
Matuggala
Denipana
Wewagama
Mawura Ganga
Hangamuwa Ganga

This is essentially an alcohol thermometer with a very large bulb and gradations only at 100° and 95° F. To use it one plunges the bulb in hot water, dries it, and measures with a stop-watch the time taken for the temperature to fall from 100° to 95°. One may also use the instrument wet, to simulate the surface of a perspiring mammal, by enclosing the bulb in a muslin bag and not drying after the immersion in hot water. The cooling power of the atmosphere at 2 p.m., by dry katathermometer, averages 6·7 millicalories per square centimetre per second. The wet katathermometer at the same time averages 15·0. The cooling power is thus much greater than at Hog Harbour, where the corresponding figures are 4·2 and 9·5. This is caused partly by the difference in altitude, but also partly by the much more open nature of the Sinharaja than the New Hebridean forest-undergrowth. It is worth while to point out that in rain-forests it is a waste of time to read the katathermometer more than once consecutively (after the instrument has first been warmed and allowed to sink to 95° F.). I arrived at this conclusion at Hog Harbour, and my experience in the Sinharaja reinforced it. I read the instrument twice daily, and found the means of the first readings (dry) to be 6·71 millicalories and of the second 6·69. A difference of 0·02 millicalories is completely insignificant. It is the absence of strong winds at a height of 1 metre in a rain-forest that makes the katathermometric readings so constant. The wet instrument is more sensitive to draughts, and here the means of the first and second readings were 14·8 and 15·1.

The total rainfall for the year averages 4054 mm. (159·6 inches). There is no dry season, for the least wet month (February) receives 189 mm. (7·45 inches). The rainfall rises to a peak (533 mm.=21·06 inches) in May, sinks till July, and rises to a second maximum in October and November. To obtain a figure indicating to what extent the rainfall of any place is seasonal, it is convenient to divide the mean daily rainfall of the wettest month by that of the driest. The result is the seasonal index of rainfall. In the table below, the seasonal index of the region of the Sinharaja is compared with that of other exceptionally unseasonal climates in various parts of the world. Differences in temperature and length of day are also shown.

	Seasonal index of rainfall.	*Difference between mean temperatures of hottest and coolest months* (° *C.*).	*Difference between longest and shortest days* (*mins.*).
San Juan, Porto Rico ..	2·1 (Nov./Mar.)	3·2 (Aug.–Feb.)	134
Pontianak, Borneo ..	2·3 (Nov./Aug.)	—	0
Sinharaja Forest	2·3 (May/Feb.)	1·8 (Apr.–Jan.)	44
Padang, Sumatra	2·5 (Nov./July)	—	7
Hog Harbour, New Hebrides	2·5 (Feb./Aug.)	2·4 (Jan.–July)	111

It is the occurrence of a high total rainfall and moderately high mean temperature for the year, combined with a low seasonal index of rainfall and a small difference between the temperatures of the hottest and coolest months, that produces, in the absence of human interference, the typical tropical rain-forest.

The relative humidity in the forest is on the average 93 per cent. throughout the night and falls to a minimum of 83 per cent. at about 4 p.m. The drying

power of the atmosphere is better expressed in terms of saturation deficit, *i.e.* the number of grams of water that one would have to add to a cubic metre of air, at the prevailing temperature and humidity, to saturate it.[1] The saturation deficit (see Appendix II) is low at all times, *i.e.* the atmosphere has little power of absorbing more moisture. It is not so low however as in the forest at Hog Harbour. From sunrise onwards it rises gradually to a maximum rather late in the afternoon, about 4 p.m., and then falls off rapidly. The particular biological significance of saturation deficit lies in its connection with the transpiration of vascular plants and the perspiration of mammals.

To get an impression of the amount of light filtering through the leaf-canopy, observations were made on fifteen days with a Zeiss "Helios" photographic photo-electric cell. The instrument was held facing vertically upwards towards the sky, away from any large tree trunk, and the proper exposure was determined for a plate of speed 29 on the Scheiner scale (a very fast plate). The sun was sometimes shining and sometimes obscured, but the exposure only varied from $^1/_{10}$ to about $^1/_4$ sec., the mean being $^1/_6$ sec. On nine days the instrument was held facing horizontally towards the east, also at 2 p.m., and the mean exposure for a plate of the same speed was $1^4/_5$ sec. These figures give a strong indication of the darkness within the forest, which is largely the cause, in all probability, of the small amount of undergrowth.

Botany

The Sinharaja presents the characteristic features of a tropical rain-forest. The general aspect is well represented in Plate 1, which shows the edge where it abuts on a *chena*. Plate 3 is an illustration of the interior. The stems of the trees are remarkably straight and unbranching for a non-coniferous forest. The general height of the forest is about 115 feet, though here and there huge giants tower above this. Woody lianas are common, but not so abundant as in some tropical rain-forests. The undergrowth is scanty, and largely simply a nursery for the trees.

The majority of the trees are evergreen, but some of the giants are deciduous. Flowering and fruiting are said by the natives to be largely seasonal, and indeed many of the trees were bearing fruit during August. Most of the timbers studied showed well-marked growth-rings. The natives of the vicinity keep to regular seasons with some of their crops (*e.g.* rice), but yams (Dioscorea) are planted at any time. In the New Hebrides, where also the climate is remarkably unseasonal, the natives take great care to plant yams at one particular time of year.

By far the most striking phenomenon presented by the Sinharaja as a whole concerns the shape of the leaves. Nearly every plant has the tip of the leaf or leaflet drawn out into a point. The common monocotyledons mostly have such very narrow leaves that further narrowing to a special tip is not easily recognized, but in the dicotyledons it is most obvious. Of the 41 dicotyledons that are commonest in the forest, no fewer than 37 have the tips drawn out, and these 37 belong to more than 20 families and include trees, bushes, lianas,

[1] Nomograms for the rapid determination of saturation deficit are available. See Baker, J. R., 1936. "Nomograms for saturation deficiency." *Journ. Animal Ecol.*, vol. 5, p. 94.

and creepers. The leaves of 22 of these species are shown in Fig. 2. Drip-points to leaves are characteristic of plants of wet regions, and particularly of tropical rain-forests, but it is doubtful whether any forest can show the

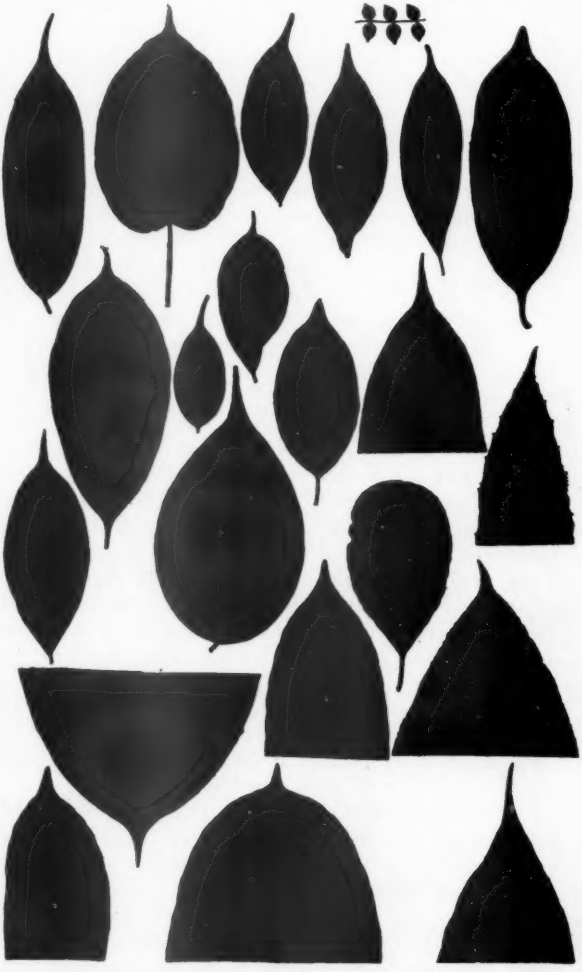


Fig. 2. Tendency to the formation of drip-points on leaves of dicotyledons

phenomenon more markedly than the Sinharaja. The effect is to allow water to run off rapidly, which must aid transpiration in an atmosphere of low saturation deficit.[1]

[1] A fuller description of the botany of the Sinharaja Forest will be published in the *Kew Bulletin of Miscellaneous Information*.

Zoology

The black sub-species of the purple-faced leaf-monkey (*Kasi vetulus vetulus*) is common, and its cry is one of the most familiar sounds. It resembles "hă-hōō-hă-hōō-hă-hōō-hă-hōō," repeated rapidly. The impression is given that the "hă" sound represents an intake and the "hōō" an outlet of breath. If so, the animal must be breathing as fast as it can to produce the sound. Sometimes it is done in a snarly voice and sometimes so softly as to resemble the cooing of a pigeon. There is also an alarm sound resembling a very sudden "honk," and a shrill cry. The species is found in groups of two or three, or singly.

At dusk the small bat *Pipistrellus ceylonicus ceylonicus* leaves the forest to fly up and down in the clearings just outside. I did not find its daytime roost, but other species (*Rhinolophus beddomei sobrinus*, *Rh. rouxi rouxi*, *Hipposideros lankadiva*, and *Megaderma spasma ceylonense*) are obtainable in caves. The last-named, with its huge ears and nose-leaf, is a grotesque object even for a member of an order where monstrosity of appearance is common. I opened the stomachs of seven specimens, to find whether they might contain any evidence to support or discredit the name of "Ceylon vampire bat" for this species. There was no recognizable food in any, though there was some reddish fluid in one. If the food were blood, empty stomachs would often be found. Iodine gave no blue coloration, such as might be expected if the natives' story of a fruit diet were true. The very large sharp teeth support the view that the diet is different from that of ordinary insectivorous bats. It is conceivable that the teeth are used for killing small vertebrates, whose blood is subsequently sucked. Fruit-bats do not occur in the forest.

The wild pig, sambhur, and elephant represent the ungulates. I did not see any elephants, but their dung was plentiful, and one came across their paths and rubbing-places on trees. The sambhur is stated by the natives to retain his antlers for several years, and it is denied that there is any particular season for shedding them. It is claimed however that the birth of young is seasonal. The males are said to fight in December and January, and to cover the females in the latter month, the young being born in July. If this is true, the period of gestation is shorter than is usually supposed.[1] The wild pig is said to give birth to young in the same month as the sambhur.

The Carnivora are represented by the leopard and palm-civet. The former is abundant and fearless. I obtained a very young specimen of the palm-civet, *Paradoxurus zeylonensis*, on August 8. This indicates a somewhat earlier breeding season for the species than was thought. I brought this specimen home to England alive, and it makes a charming pet. I feed it chiefly upon bananas and apples, with an occasional scrap of meat or an egg. The bear does not occur. The local giant squirrel is the striking black and yellow sub-species (*Ratufa macroura melanochra*).

Birds are seldom seen as one walks through the forest, though probably plentiful enough in the canopy far above. The ornithologist would be attracted much more to the small woods of much-branched trees outside the forest, for in these it is far easier to see the birds. It is pleasant to record that the

[1] Phillips, W. W. A., 1935. 'Manual of the mammals of Ceylon.' Dulau, London.

hornbill (*Lophoceros griseus gingalensis*) is neither rare nor particularly afraid of mankind. One of the most familiar sounds of the forest is the loud cry of the barbet (probably *Cyanops flavifrons*). The jungle-fowl is said to lay in this district in April.

There are two common species of lizards in the forest, both dull-coloured. These are the Agamid, *Otocryptis wiegmanni* (Wagler), and the skink, *Lygosoma taprobanense*. The former has remarkably long legs for a lizard. It surprises one by jumping headlong into water when pursued. I discovered a convenient way of obtaining specimens of lizards. Approaching very slowly with a paper-covered volume poised ready to strike, one hits as instantaneously as possible, without making the slightest preparatory movement. The specimens are killed with little damage.

Poisonous snakes are unpleasantly common. They include the cobra, tic-polonga, and Ceylon pit-viper (*Trimeresurus trigonocephalus*). The harmless, brilliant green tree-snake (*Passerita mycterizans*) also occurs.

Insect life does not greatly obtrude itself upon one in the forest, with the exception of the incessant singing of the cicadas (*Purana tigrina*). One is not bitten by mosquitoes. In camp, just outside the forest, the only troublesome insect is the large "elephant-fly" (*Tabanus* sp.), which bites painfully. Tiger-beetles (*Cicindela discrepans*) are common on the ground in the forest. Brilliant fire-flies (*Luciola vespertina*) enliven the night in camp.

Two species of dragon-fly are common, especially near the streams. One of these, *Ceylonosticta hiliaris* (Selys), has the habit of jerking the tail up and down when sitting in a conspicuous place, and thus displaying its brilliant blue extremity. A similar display has been recorded in an Australian species (*Hemiphlebia mirabilis*[1]). Courtship has seldom been recorded in the dragon-flies, and therefore I was astounded to witness an elaborate form of it in another Sinharaja species, *Euphaea splendens* (Selys), which is abundant and striking in appearance. The body and wings are black, but the wings have brilliant green patches which show vividly in flight. The courtship proceeds as follows. One partner (presumably the female) is chased by the other, the course being irregular. Suddenly the male leaves her and she sails down to the water, just touches it, and instantaneously turns right round and comes straight back along her former path. The male approaches rapidly. As soon as they are nearly in collision, they both fly about two feet vertically upwards at great speed. The irregular chase now begins again, and is interrupted by the female once more sailing down to the water. The whole dance is repeated again and again, endlessly. Although I waited for perhaps ten minutes, I did not see copulation occur.

The abundance of land-leeches (*Haemadipsa zeylanica*, Moquin-Tandon) greatly detracts from the pleasure of studying the Sinharaja Forest. I found it best to wear thin breeches cut like "plus-fours," stockings, boots with the tongues sewn in right up to the top, and puttees. This clothing by no means prevents leeches from penetrating to the skin of one's legs, but it greatly reduces the annoyance. I did not find chemical methods of protection valuable, for chemicals are washed off every time one wades through a stream.

[1] Tillyard, R. J., 1912. "On some new and rare Agrionidae (Odonata)." *Proc. Linn. Soc. N.S.W.*, vol. 37, p. 404.

The leeches live upon the ground and attach themselves first to the feet. They do not ascend far above the knees, probably because they fall off if they succeed in drawing blood and become inactive fairly soon from evaporation if they do not. If a leech be put into a dry cardboard box it dies by evaporation within a day and hardens into a brittle mummy, retaining the natural shape. If placed in a closed glass tube with a little water, it will live for many days. On skin and also on glass, these leeches tend to ascend vertically, and it is therefore remarkable that they do not ascend plants. They are aware of the presence of human beings, and if one stays still, they loop along almost directly towards one at a surprising speed. It is amusing to place a leech on a table and to keep it there by always moving one's position when it has nearly reached the edge. Since leeches avoid open spaces, it is surprising to find that they are positively phototropic towards a fairly weak light. Thus, if a petrol lantern be placed on the ground during the night, it will attract the leeches in the neighbourhood; and this tropism overcomes the presumably olfactory one directing them towards a human being.

It is well known that these leeches are very sensitive to tobacco, and I decided to investigate the matter. I made up aqueous solutions of nicotine at various concentrations in the series 1, $^1/_2$, $^1/_4$, $^1/_8$, etc., per cent. (by volume), and put leeches into them for a period of five minutes. It should be remarked that they live indefinitely in water. At the end of five minutes I washed the leeches twice in water and left them for an hour in an atmosphere saturated with water-vapour. I then tested the apparently dead ones by noticing whether they gave even the slightest response to mechanical or chemical stimulation. If not, they were taken to be dead. Concentrations of nicotine down to 1/128 per cent. kill the leech, while the solution at 1/256 per cent. allows very slight contraction to be visible on stimulation. 1/512 per cent. solution does not kill in five minutes. It is curious that nicotine should be so potent that one part in 12,800 suffices to kill in five minutes, for it is not a particularly virulent cell poison. Its action in poisoning mammals is upon the nerves leading to the autonomic nerve ganglia. These nerves have no counterparts in leeches.[1]

Anthropology

The natives of the vicinity of the Sinharaja are Kandyan Sinhalese. All are Buddhists. The men wear the hair long, in a bun at the back of the head. Their usual clothing is a loin-cloth. When working in the sun they wear a broad-brimmed hat made of rattan. The women wear a cotton skirt and usually a tight sleeveless vest, not reaching to the top of the skirt. The houses (Plate 2) are of mud, plastered on to a rectangular wooden framework. There is no window. The interior is divided into rooms. The thatching is usually of coconut leaves. There are schools for the children in the neighbourhood (at Potupitiya and Panapola), but the children of the remote villages

[1] I wish to thank Mr. Malcolm Stewart, Captain N. D. Riley, and Mr. C. C. A. Monro for identifying my reptiles, insects, and leeches. My chief interest in the Sinharaja Forest is in the breeding seasons of animals in the little-varying climate, and I arranged for the periodical collection of animals with a view to the study of this subject. Sufficient time has not elapsed to enable me to report.

1. Edge of the Sinharaja Forest near Hapugoda exposed by recent felling

2. Typical house in the vicinity of the Sinharaja Forest

3. Interior of the Sinharaja Forest near Hapugoda

(*e.g.* Pitakele and Denihena) are not educated. The headmen receive the Kandyan titles, the lower grade being *arachchi* and the higher *korala*. The usual serious, unsmiling character of the Sinhalese is much in evidence, and I only once saw a Sinharaja native laugh loudly. This was when another native mistook some salt for sugar.

The local inhabitants, especially those of the district known as the Kukulu Korale, are regarded by the natives of the surrounding districts as foolish and willing to damage themselves if they can thereby hurt others. Their critics tell a story which illustrates this mentality. In selling the toffee-like substance called *jaggery*, the standard portion is two blocks, each maintaining the shape of the half-coconut in which it was prepared. The two blocks are placed together with their flat surfaces apposed, and bound round with leaves, a convenient package being thus produced. The Sinharaja native is supposed to have been paid for one of these packages, and then to have thought to himself, "I'll put three blocks in instead of two, because then it will be a more inconvenient package for the buyer to take away." I myself found them neither foolish nor vindictive, and was charmed by their interest in natural history. Although they themselves have so much knowledge of this subject, they could not understand my devoting all my time to it, and they were firmly of opinion that the meteorological instruments in the forest were placed there to detect buried treasure. They hold the forest itself in great veneration, and consider that any crime committed in it is particularly evil. The killing of animals and the eating of flesh are contrary to the precepts of Buddhism, but no exaggerated importance is generally attached to this; few natives however would transgress in the forest itself. For this reason pressure was brought to bear upon me not to place my camp actually within the forest. There is a tabu against any man entering the forest while his wife is menstruating.

The people are largely of the *goygama* and *jaggery* castes. On the march carriers of different caste do not refuse to eat together, and all join in conversation, apparently on terms of equality.

Conclusion

The Sinharaja presents the typical characters of a virgin tropical rain-forest. It is the only considerable area of such forest left in Ceylon, though formerly the whole of the low-country wet-zone must have been similarly clothed. It is remarkable for the straightness of the stems of the trees, which are branched only high above the ground, and for the almost universal development of drip-points to the leaves. The climate is equable, with some rain at all seasons; but most of the trees show seasonal phenomena in reproduction, and some of the largest are deciduous. It is greatly to be hoped that the forest will be preserved in its natural state as a record of the former condition of a large part of the island.

APPENDIX I

Means of daily meteorological observations in the Sinharaja Forest during August 1936. Figures for the corresponding month (February) at Hog Harbour, New Hebrides, are given for comparison.

	Sinharaja Forest, 1900 feet.	*Forest at Hog Harbour, 55 feet.*
Maximum temperature	24°6 C	26°7 C.
Minimum temperature	20·6	22·6
Daily range in temperature	4·0	4·1
Grass minimum temperature	20·5	—
Ground temperature	21·7	25·4
Relative humidity at 2 p.m.	85 %	90 %
Saturation deficit at 2 p.m. per cubic metre ..	3·2 g.	2·5 g.
Cooling power of atmosphere at 2 p.m., dry kata, milli-calories per sq. cm. per sec.	6·7	4·2
Cooling power of atmosphere at 2 p.m., wet kata, milli-calories per sq. cm. per sec.	15·0	9·5
Vertical light at 2 p.m., exposure for Sch. 29 plate in secs.	1/6	—
Horizontal light from the east at 2 p.m., exposure for Sch. 29 plate in secs.	1⁴/₅	—

APPENDIX II

Analysis of thermohygrograph records in the Sinharaja Forest during August 1936. The figures are the means of the daily records, corrected by repeated observations of the whirling hygrometer. The temperature does not reach the mean maximum given in Appendix I, because the maximum is reached at different times on different days.

	Temp. °C.	*Rel. humidity.* %	*Sat. deficit.* *Grams per cu. metre.*
Midnight	21·0	93	1·3
2 a.m.	20·9	93	1·3
4 ,, ...	20·7	93	1·2
6 ,, ...	20·6	93	1·2
8 ,, ...	21·0	92	1·5
10 ,, ...	22·3	90	2·0
Midday	23·7	87	2·8
2 p.m.	23·9	85	3·2
4 ,, ...	23·4	83	3·6
6 ,, ...	22·3	92	1·6
8 ,, ...	21·3	93	1·3
10 ,, ...	21·0	93	1·3

APPENDIX III

Analysis of Mr. J. L. Martin's records at Beverley Estate (2150 feet), adjoining the Sinharaja Forest. The temperatures are the monthly means of the daily

maxima and minima from May 1934 till September 1936, inclusive. The rainfall is the decennial monthly mean, 1926–35.

	Mean temp. °C.	*Mean daily rainfall.* mm.
January	22·9	7·3
February	23·3	6·7
March	24·2	9·9
April	24·7	11·3
May	24·0	17·2
June	23·3	13·6
July	23·4	7·7
August	23·7	8·5
September ..	23·7	9·9
October	23·6	14·5
November ..	23·7	14·6
December ..	23·2	11·7

Mean total rainfall for the year, 4054 mm. (159·6 inches).

HVITSERKR

NOTE: *The identity of Hvitserkr, a "high mountain" on the Greenland coast, mentioned in early sailing directions, has been a matter of some controversy. In a recent article in the* Norsk Geografisk Tidsskrift (*vol.* 5, 1935, *pp.* 429–43) *the view that it is identical with the summit of the Watkins Mountains on the Blosseville coast was advanced by Mr. J. Kr. Tornøe. A translation of this article was prepared, at the instance of Mr. Augustine Courtauld, by Mr. Michael Spender. The following note has been compiled in part from this article by the Librarian, who has been assisted by Mr. Spender's knowledge of conditions on the East Greenland coast.*

AS will appear from this note, the name "Hvitserkr" has been applied at various times to features on different parts of the Greenland coast. Among its earlier uses, it is found as a substitute for an older name of the "ice mountain" at Erik the Red's landfall on the east Greenland coast, to the west of Breiðafjörður, in Iceland. At about the same date, and for some time afterwards, it was given to a high mountain on this coast which, from Denmark Strait, was intervisible with Snaefellsjökull, in Iceland. Later, it was applied to a landmark in south-west Greenland near Cape Farewell. It is suggested here that it should properly be used for the second of the above features, and that, though the summit of the Watkins Mountains is not on the coast, but about 40 miles inland, it is the only point on the East Greenland coast which could be seen simultaneously with the mountains of Iceland.

The discovery of Greenland by Erik the Red is described in the *Hauksbok* thus: "He (*i.e.* Erik) said to them that it was his intention to go in search of that land which Gunnbiørn, son of Ulf the Crow, saw when he was driven out of his course, westward across the main, and discovered Gunnbiørns-skerries. . . . Erik sailed out to sea from Snaefells-jökull, and arrived at that ice mountain which is called Blåserkr. Thence he sailed to the southward that he might ascertain whether there was habitable country in that direction." (Translation from A. M. Reeves, 'Finding of Wineland the Good,' p. 30.)

This version dates from the early fourteenth century. The name of the "ice mountain" at which Eric arrived is also given as "Bláserk" in the Flatey Book version of *circa* 1390.

There is a tradition, preserved in Bjørn Jonsson's 'Description of Greenland,' that Erik sailed in search of Greenland because the old people remembered that Gunnbjørn, son of Ulv Kraka, said he thought he had seen a hill away to the west in the ocean at the same time that he could see Snaefellsjökull in Iceland.

A somewhat later version of the discovery is contained in the 'Saga of Eric the Red,' which is generally ascribed to *circa* 1400. This agrees in the main with the *Hauksbok* text—but in it "Hvitserkr" has been substituted for "Bláserk." Thus the evidence of the sagas regarding the use of the name "Hvitserkr" is that, towards the end of the fourteenth century, it replaced an older name for the "ice mountain" on the East Greenland coast sighted by Erik. Traditionally there also appears to have been a suggestion that

Erik was seeking a portion of the East Greenland coast, of which a feature was intervisible with Snaefellsjökull from the sea west of Iceland.

It will be seen later that about, or soon after, the time that Hvitserkr was substituted for Bláserk in the sagas, sailing directions for these waters contain references to Hvitserkr as being intervisible with Snaefellsjökull. It is possible that this name was substituted for the older, being well known at the time as that of a prominent sailing mark. It is not necessary therefore to conclude that Hvitserkr was in the vicinity of Erik's landfall.

It was long thought that it is impossible to see Greenland and Iceland at the same time, but Mr. Tornøe has collected evidence to show that under very favourable conditions it is possible from the middle of Denmark Strait to see the mountains of the Blosseville coast and Iceland simultaneously. He describes the results of his inquiries thus:

"Our own course lay further to the west than it should have if we were to see both lands at the same time, so I took my diary and asked the crew what they had to say to this suggestion. Our skipper supported the idea, and I noted in my diary 'Skipper Peter Brandal, jnr. said that in about 68° N. latitude he had seen the mountains of Iceland and Greenland simultaneously. Engineer Olaf Henriksen, who has sailed for many years with the sealers, had several times seen the mountains on both sides. They can be seen from the deck and not only from the crow's nest. I asked whether they had seen both lands simultaneously when they were further south in Denmark Strait, but none had. They were in agreement that it was only in the waters where they were, *i.e.* in 68° N. latitude, that they could see both countries at the same time.'

"The crew's statements were very convincing and it seemed to me that the old accounts might well be quite right. Fridtjof Nansen discusses the matter in his book 'In Northern Mists,' and states, 'In one or two passages of the old narratives it is related that when one was halfway between Iceland and Greenland one could see at the same time in clear weather, Snaefells glacier in Iceland and Bláserk (or Hvitserk) in Greenland. According to my experience this is not possible, even if we call in the aid of a powerful refraction or even mirage: but, on the other hand, one can see the reflections of the land or the ice on the sky, and when sailing (along the edge of the ice) eastwards or westwards, one can very well see the top of the Snaefells glacier and the top of Ingolf's Fjeld on the same day' (Vol. I, pp. 295–6).

"It can thus be seen Nansen does not think it possible that the two countries can be seen at the same time, so I must see whether the information I have collected on the matter is based on a misunderstanding.

"Since Nansen published the above-mentioned book in 1911 we have learned a great deal more about Greenland. The sealers' statements that they had seen both countries simultaneously are therefore new. Also, we have information about the height and position of several mountains on Greenland which can be used to calculate the distances from which they can be seen.

"Visibility in the Arctic regions can be very markedly increased when a

layer of warm dry air comes in over a cold heavy mass of air (see Professor Hobbs in *Geografiska Annaler* XV, Stockholm 1933, page 218).

"To be certain that my notes were all right and that I had not misunderstood my comrades during the trip to Greenland, I wrote to the ice skipper Martin Karlsen, Brandal, and asked him to look more closely into the matter. I got the following answer dated 15 February 1933: 'I have talked to Petter Brandal about this question and have had from him that he was in 1927 on the *Polaric*, and then saw simultaneously Iceland and Greenland. I have talked to Skipper Johan S. Overa, Hjørungavag, who was skipper on the *Polaric* in the same year, and he also says that that year they saw both lands simultaneously.

" 'I could not get hold of Engineer Henriksen, but I have talked with many other ice skippers here. There are certainly not many who have seen both countries simultaneously; none others I have met have seen it, but all have heard from other skippers of occasions when one has seen both lands, and in particular the oldest active ones have. It is probably something which happens once every twenty years.'

"In a later letter of 1933 Mr. Karlsen reports having a letter from a very experienced ice skipper, who wrote that 'in 1917 while he had the *Løftingen* he saw both countries very clearly; the weather was exceptionally favourable.' "

Sailing directions for the Greenland voyage and other documents record the fact that Greenland and Iceland can be seen simultaneously, but before discussing these, it is necessary to make clear that there were two possible sailing routes to the settlements in Greenland, and that it is from this that confusion has arisen when attempting to identify landmarks mentioned in the directions. Mr. Tornøe points out that the best route from Nidaros, for example, would be to Langanes in the north of Iceland, and thence by Denmark Strait to south-west Greenland. This route would have the advantage of avoiding the contrary currents of the Gulf Drift, and would in general give good weather conditions. On this route the mountains of the Blosseville coast would undoubtedly be seen. The second route was to the south of Iceland, on which the landfall would be made in the neighbourhood of Cape Farewell. As compensation for the advantages of the northerly route, it offered a route lying well away from the ice-floes of the eastern coast. In the course of time the northern route was abandoned in favour of the southern, possibly on account of the advance of the ice, for Ivar Bardsson records: "This was old sailing, but now ice has come from land northward so near the said skerry that no man without danger of his life can sail the old way which is hereafter yielded up." (Quoted from T. N. Garde, "The Navigation of Greenland" in 'Greenland,' edited by M. Vahl and others, vol. III, 222).

Portions of early sailing directions for this northern route can be found in the various collections made later. In Ivar Bardsson's, which date from the middle of the fourteenth century, it is stated that sailing west from Langanes, in the north of Iceland, "one first comes to Hvitsärk before passing Hvarf," that is, near Cape Farewell, in south-west Greenland. They also include several references to the simultaneous sighting of Iceland and Greenland. At the beginning of the sixteenth century Bishop Walkendorf collected many

GRVNTLANDIE
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Portion of Lafreri's reduced version of Olaus Magnus' "Descriptio septentrionalium terrarum," Rome, 1572; enlarged by one fifth

Portion of map from Hendrik Doncker's "Zee-Atlas," Amsterdam, 1660; enlarged by one quarter

of these directions, with additions of his own. He states that from mid-way between Iceland and Greenland, Hvitserkr and Snaefellsjökull in Iceland can be seen simultaneously, and adds "It is credibly reported that it is not thirty sea leagues to land, in whichever direction one would go, whether to Greenland or to Iceland." This latter comment, Nansen remarks, is very near the truth (*op. cit.*, vol. I, 295). Further, Walkendorf remarks: "Item when one is south of Bredefiord in Iceland, then he must steer westward until he sees Hvidserch in Greenland, and then steer south-west until the above-mentioned Hvidserch is to the north of him; thus may one with God's help freely seek Greenland." These directions can be based only upon the assumption that Hvitserkr lay on or near the Blosseville coast.

Gissur Einarsson records, *circa* 1541: "If the weather is clear and visibility good, with course due west, Snaefellsjökull on Iceland can be seen to the north-east and Hvitserk on Greenland to the north-west" (quoted from Tornøe).

A slightly earlier document, a letter of Carsten Grip's, *circa* 1470, also puts Hvitserkr in this approximate position: he describes it as "the rock Hvitserkr off Greenland over against the Snaefelljockull on Iceland towards the sea" (Louis Bobé, in 'Greenland,' vol. I, p. 2).

When the northerly route was displaced in favour of the southern, it is reasonable to suppose that with the customary conservatism of sailors, the navigators, in the absence of any charts of Greenland, attempted to fit the names of landmarks on the old route to prominent features on the new. This process is apparent in the directions of Bardsson, for having, as noted above, defined Hvitserkr in relation to Langanes, he states elsewhere that "the day before Hvarf is sighted one sees Hvitserk and between these two mountains lies Herjolfnes." Again, in the *Gripla*, a collection, made about 1600, of documents of uncertain age, occurs this passage: "But there are bays before, and the country stretches towards the south-west; there are glaciers and fiords, and islands lying off the glaciers; to the one glacier no man can penetrate; to the second there is a half-month's sailing; to the third a week's sailing; it is nearest the 'bygd' (*i.e.* settlement); it is called Hvitserk: then the country turns towards the north, but he who will not miss the settlement should steer south-west" (see T. V. Garde, *op. cit.*, p. 222).

These and similar statements have led commentators to identify Hvitserkr with features in the extreme south-west of Greenland, and to refuse to accept its identification with a mountain on the east coast. Approaching the coast in the neighbourhood of Lindenow Fiord, both the mountains at its head and the ice sheet south of it are conspicuous features, and either may well be the "Hvitserkr" of the later navigators. But if the above argument is correct, the name was transferred to this locality when the old sailing route was abandoned.

To summarize the conclusions in favour of the identification of "Hvitserkr" with the peak in the Watkins Mountains: the record of the possibility of seeing Iceland and Greenland simultaneously may date from a period prior to Erik's voyage; at any rate, the possibility is stated in documents collected at the beginning of the sixteenth century but embodying a much older tradition: the older sailing directions also support the view that Hvitserkr

was a mountain on or near the east coast. According to Tornøe's records, it is possible to see the Watkins Mountains and Iceland at the same time, the former being the only mountains high enough near the east coast to make this possible. It is therefore legitimate to surmise that Hvitserkr was applied to a peak of these mountains, and that its identification with mountains much further to the south-west is based upon a later tradition which co-existed for some centuries with the older tradition.

Lack of precise knowledge of the height and position of the Watkins Mountains, due especially to Amdrup's deliberate exclusion of any detail he had not seen when making his map of the Blosseville coast in 1900, has caused previous discussions of this problem to be incomplete. According to the present position of the highest summit (see *Geogr. J.* 88 (1936) 206), with a height of 12,200 feet, the two mountains would not be intervisible under the normal conditions of refraction assumed in survey computation. But the divergence from normal conditions, by no means unusual in the Arctic, would not have to be very excessive to allow the two summits to be intervisible from a vessel in Denmark Strait.

It is interesting in this connection to record the first cartographical representations of Hvitserkr. In 1532, Jacob Ziegler's 'Schondia,' a description of the northern countries, was printed at Strasbourg. This was accompanied by a map, having on the east coast of Greenland opposite Iceland a "Hvetsargh promontorium." Commander F. H. Trap ("The Cartography of Greenland" in 'Greenland,' edited by M. Vahl and others, vol. I, pp. 137 ff.) believes that this conception was derived from the same source as Carsten Grip's, quoted above, that is, the voyage of Pining.

In 1539, Olaus Magnus' 'Carta marina et descriptio septentrionalium terrarum' was published at Venice: in the sea off Vestrabord, in Iceland, is shown a rock with the name "Hvitserk," on which is a circular compass card. Olaus appears to have had two opinions as to the position of Hvitserkr, for in his book, 'Historia de gentibus septentrionalibus,' 1555, he has these two passages: "rupes Hvitsark . . . quae mediam navigationem continet ad Gruntlandiam" (*scl.* a portu Vestrabord Islandiae) and "Orientaliora huius terrae (*i.e.* Gruntlandiae) . . . intermedia rupe Huitsark praedicta."

Subsequent cartographers have followed one or other of these versions. Lafreri's reduced version of Olaus' map, published at Rome in 1572, shows the rock in the sea, and this is copied by Mercator (1559) and Ortelius (1571). Some cartographers in the following century, perhaps following Ziegler, show Hvitserkr as a mountain some distance inland from the east coast of Greenland, *e.g.* Hendrik Doncker, or Danckerts on the map of Greenland in his "Zee-Atlas of Water-Waerelt," Amsterdam, 1660, a section of which is here reproduced.

REVIEWS

EUROPE

GREAT BRITAIN: Handbook for Travellers. By KARL BAEDEKER. *Leipzig: Karl Baedeker* (*London: George Allen and Unwin*), 1937. (Ninth Edition.) $6\frac{1}{2} \times 4$ *inches;* lxii+696 *pages; maps and plans.* 16*s*

The front folding map of England and Wales is printed on both sides, one giving orographical shadings, and the other the same map concentrating attention on roads—arterial, main, and other good roads. It is a sound idea to start with a comparative table of measures and of thermometric scales. This should smooth out some of the difficulties continental visitors experience with our insular ways. But for British tourists also this volume, unique in its comprehensive survey and its mass of detailed information, will amply repay its cost, and save time, money, and annoyance: "it is certainly not meant," in the words of the preface, "to lead him into a senseless hustle through all the 'sights' of the country." Naturally local guides should be used to supplement this marvel of compression. First issued fifty years ago, it has been mainly the work of British editors. The writer of the present edition is H. A. Piehler, who retains two useful features: a geographical introduction by the late Dr. George G. Chisholm, and a historical sketch of the architecture of England by E. A. Freeman. Motorists will profit by a perusal of pp. xviii and xix. The index of 50 three-column pages gives references to all places but the smallest villages and hamlets. The text shows that the writer has not depended solely on compilation from books, but has been an alert eye-witness on his 10,000 miles of motoring. The seven divisions of the book treat in order of south-east, south-west, central, eastern, and northern England, Wales, and Scotland. In passing we may note that the castle at Amberley, Sussex, is not now purely a ruin, but occupied, and that the Bignor Roman pavements are not mere tessellation, but mosaics; and it may be doubted whether the Arun is still noted for its mullet. Probably residents in various localities could correct small details, but in districts the reviewer knows comparatively well the facts are remarkably accurate.

S. E. W.

LONDON: A combined guidebook and atlas. *London: Thos. Cook & Son,* 1937. $7\frac{1}{2} \times 5$ *inches;* 172, 37 (atlas)+81 (index) *pages; maps and plans.* 5*s*

Messrs. Thos. Cook & Son first issued a 'Traveller's Handbook to London' sixty years ago. The present volume is an entirely new work both in content and character, an excellent *multum in parvo* at a very moderate price. For visitors to London with little time to spare five drives (pp. 32–51) are described and mapped, "to show what is best worth seeing in a short time, and to give a preliminary idea of the 'layout' of London and the distribution of the principal places of interest." More leisurely itineraries of shorter routes, planned for a pedestrian explorer, provide more detailed notices. Good and plentiful maps and plans, clearly lettered, are a most useful feature of the book, and a map of London and suburbs showing railways and main roads is especially worthy of mention. The sectional maps (37 pages) are divided for reference into mile squares. An index to streets and buildings in 81 double-column pages contains 10,000 references. A slight error (p. 68) appears in reference to Christ Church, Newgate Street. The present church, built by Wren, occupies only half the

site of the former Franciscan church. However a work of this character is almost bound to embody a few minor mistakes, notification of which the publishers express themselves as glad to receive. S. E. W.

LONDON WALL, THROUGH EIGHTEEN CENTURIES. By WALTER G. BELL, F. COTTRILL, and CHARLES SPON. *London: The Council for Tower Hill Improvement (Agents: Simpkin Marshall)*, 1937. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* x+124 *pages; illustrations and plans.* 3*s* 6*d*

Though not mentioned on the title page, Miss E. Jeffries Davis has had a share in this work, and Mr. W. S. Barclay's foreword is excellent. The Roman wall is dealt with by Mr. Cottrill, the mediaeval by Mr. Bell, and the Tudor and later wall by Mr. Spon. Specially commendable is the wealth of illustrations, and the spirit of the London Passenger Transport Board in preserving and making accessible part of the wall at Trinity Place. In these pages we have a scholarly, authoritative and pleasant treatment of the subject: the reader may be confident that he has the best to date in this first book dealing solely with the wall, hitherto much neglected by the general public. The end map marks plainly the places where one may see its remains. The wall to-day, even if a ghost, is one which haunts all parts of the City. To it we owe our unique City within a city. Any one who takes this brightly written book for a guide will be convinced that the two miles of the London wall was and is a substantial reality, and that Newgate and Aldgate mean far more than he had supposed. S. E. W.

THE ISLANDS OF IRELAND. By THOMAS H. MASON. *London: B. T. Batsford*, 1936. 9×6 *inches;* viii+136 *pages; illustrations and maps.* 10*s* 6*d*

The islands off the west coast of Ireland, with which this book is chiefly concerned, from their remoteness and relative unattractiveness to invaders, offered a refuge to the monuments and traditions of pre-Christian and early mediaeval Ireland. But this archaeological wealth is not their sole interest. The small communities on each island have evolved their own methods of dealing with their wild environment remote from the material progress of the modern world. Apart therefore from the natural beauty of the scenery, they offer much to the visitor prepared to accept their standards and to respect their feelings. Mr. Mason in the last thirty years has visited most of them, and delved into their past associations. His book is a most delightful mixture of tradition and history, personal experiences and amusing anecdotes. One of his most interesting chapters deals with the little-frequented Tory Island, the inhabitants of which retain a remarkable oral tradition, and have developed unusual implements, largely from the iron of wrecked ships, and characteristic canvas-covered boats or canoes. The author has an interesting chapter on the evolution of the island boats from the round coracles of the River Boyne. Among the other lesser-known islands he describes are Inishere, one of the Aran Islands, Inishmurray, and the Blasket islands, giving in a short space the essential characteristics of life on each. He remarks that many of the islanders feel more closely bound by family and economic ties to the United States than to the mainland, and this is one of the factors which have hindered the revival of Gaelic. Mr. Mason makes no parade of learning, but his historical disquisitions appear in most cases to be well founded. He should not, incidentally, attach any significance to the tradition that a man from Galway accompanied Columbus on his first voyage; nor can his explanation of the losses of the ships of the Armada be uncritically accepted. It is unlikely that Ortelius' map of Ireland was employed by the Spanish navigators. From the connections between Spain and Galway one would have expected the Spaniards to have had a better

knowledge of the western coast. Probably the weather was largely responsible for the disasters.

The photographs in this volume are particularly interesting, and no doubt in time will be of considerable historical value. G. R. C.

GÉOGRAPHIE DE L'EUROPE. By RAOUL BLANCHARD. *Paris: Félix Alcan*, 1936. 10×6½ *inches;* viii+484 *pages; illustrations and maps.* 50 *fr.*

This French version of a book already reviewed in the *Journal* (January 1937), enables one to see how much the work suffered through a poor translation, but as the translation was actually published before the "original" version there was no means of knowing what Professor Blanchard had really written. Generally speaking, the author may be said to have achieved what he modestly claims in the Preface: a summary of the geography of Europe for the general public; and though he surmises that the specialist may judge the book to be incomplete and the ordinary reader may find it too full of facts to be digestible, yet on the whole Professor Blanchard has skilfully avoided both multitudinous detail and over-generalization. Moreover, he has successfully maintained the balance between the various aspects of European geography and between the claims of the various regions and countries.

The treatment is mainly regional, though the introductory chapters are devoted to generalities on structure, relief, etc., and the final chapters to the population and resources of Europe as a whole. The two sections dealing with the factors making for unity or antagonism within the continent are particularly noteworthy. The regional descriptions are lively and vivid, though there is sometimes a tendency to over-simplify in the effort to give a clear impression; *e.g.* the statement that "Mull et Skye sont entièrement éruptives" needs to be very considerably qualified.

The book is written in a pleasant and interesting manner and with the charm of style which has come to be associated with the leading exponents of the French school of geography. M. R. M.

CASTILIAN OCHRE. By RICHARD and PHYLLIS PEARSALL. *London: John Murray*, 1935. 9×5½ *inches;* xii+274 *pages; illustrations and sketch-map.* 10*s* 6*d*

I SAW SPAIN. By BERNARD NEWMAN. *London: Herbert Jenkins*, 1937. 8½×5½ *inches;* 320 *pages; illustrations and route-map.* 10*s* 6*d*

The Pearsalls are artists, and their "brightly written narrative," together with its "amusing illustrations," covers a journey which began at Irún and kept well to the west of Madrid, taking in Pancorbo, Olmedo, Plasencia, Trujillo, Guadalupe, and Zamora, in addition to other and more familiar places. The authors appear to be versed in Spanish affairs, but if they have any real sympathy for the people of Spain, they do not show it. They record their impressions in a dry and brittle style, that attempts to reproduce the atmosphere of the country. Spain may be dry, but Spaniards are individualistic and full of zest; not impersonal and despondent as the Pearsalls picture them. "Don Quixote and the Guardia" is an example of an impression that just misses the mark, even as the illustration (p. 100) of a Spanish railway carriage just fails to convey the humour of the situation. The book as a whole suffers perhaps by challenging immediate comparison with the impressions of other English *matrimonios* who have travelled recently in the Peninsula with brush and pen.

Mr. Newman also traversed western Spain. He went from Navarre, through Asturias and León, the Castiles, and southwards by Estremadura and Andalusia to Morocco, journeying not in ill-coordinated trains but on his bicycle. There

is no flavour of elegance or artistry about his writing. His account of the journey, though it was undertaken in summer 1936 in anticipation of the trouble to come, is not planned as a political thesis, nor yet as a guide-book, though the author's powers of observation and ability to make contact with the people would have qualified him to write either. In his mind's eye the Spain of tradition is always contrasted with the vision of the monotonous central plateau, the treeless valleys and depressing hills, and the infrequent villages with their whitewashed mud cottages. From Salamanca he made his way through Las Hurdes, to which some of his best pages are devoted. As he journeyed southwards the political horizon grew more clouded, and at Malaga he had a foretaste of what was to come. He crossed the Straits and was finally defeated by the sands of the Sahara, which he somewhat innocently challenged on his bicycle; and even as he returned to Europe, the Civil War broke out.

The regionalism of Spain should perhaps not be unduly stressed. The rope-making and mud villages of Navarre could be paralleled in the province of Murcia, in the opposite corner of the peninsula. (And the *jota*, which is attributed here to Navarre, would be vigorously claimed by most Aragonese.) Mr. Newman's account, whether describing conditions in the Asturian mines or in the villages of Andalusia, suggests that the problems of Spain are common to all her peoples, and that their gravity outweighs regional differences. These problems, the tragedy of Spain, are considered by the author in a final chapter, in which the emphasis is not always rightly placed. The facts which he tries to summarize (p. 274) would be better explained if the civilization of Spain's Golden Age were regarded as a late flower of mediaevalism. To say that "Spaniards openly recognized themselves as a decadent nation" after 1898 is to ignore completely the work of the "generation of '98." This chapter is not free from errors: Sr. Azaña (Mr. Newman consistently omits the *tilde*) was defeated in the elections in autumn 1933, and not in spring 1934 (p. 292). Three-quarters of Spain (p. 295) is not a land of vast estates: this may apply to the south, but elsewhere agrarian problems arise from the multitude of small holdings. With his emphasis on what the individualism of Spain implies for the future, few will differ. Mr. Newman apologizes for the monotony of some of his chapters. If this book be less light-hearted than some of his others, the reasons have by now become apparent, and they have added to its value.

J. P. H. M.

ATTI DEL XII CONGRESSO GEOGRAFICO ITALIANO, tenuto in Sardegna dal 28 aprile al 4 maggio, 1934. [Issued by] Comitato per la Geografia (Consiglio Nazionale delle Ricerche). *Cagliari: Società Editoriale Italiana*, 1935. $9^1/_2 \times 7$ *inches;* lxxii+464 *pages; maps and diagrams together with "Atlante"* [separate case of 12 maps]

The relatively small quota of scientific literature of Sardinia has been greatly extended recently as a result of the meeting of the Twelfth Italian Geographical Congress in the island in 1934. Thus forty-three papers are printed here, twelve being accompanied by separate maps, mostly in colour, showing various distributions on the scale 1/M unless otherwise stated: relief, a well-printed layered map including Corsica (2/M); structure and land form (with Corsica); springs (2/M); prehistoric *nuraghi*; economic minerals; climatic elements; reservoirs constructed and proposed; agricultural types; livestock; population density, 1861, 1921, 1931; industries; public works.

The most important distribution which is still lacking is that of malaria, but the production of a real survey of the disease is strongly advocated by Professor de Magistris in an important paper in which he reviews the reduction of

mortality from this cause. He rightly stresses the inadequacy of statistical cartograms and presses for detailed mapping.

The reader of this volume as a whole would do well to begin with an excellent and well-documented study by G. Alivia on the "Natural and historical factors of the economy of Sardinia," since it places the various influences at work in true perspective and stresses the distance of Sardinia from the metropolis of each of the states which have controlled it, from Carthaginian times onwards, the result being that no effective colonization with adequate protection could take place. Thus the land has not received the repeated accesses of new blood which were a feature elsewhere in the Mediterranean. Moreover, dangers of invasion and malaria have resulted in the population virtually abandoning the long coast-line and failing to develop either fisheries or trade.

M. Gortani draws attention to geological problems awaiting solution; E. Borghesan reviews the varied mineral resources both genetically and quantitatively; S. Vardabasso, in a paper too long even to outline here, but well worthy of study, deals with the geomorphology of Corsica and Sardinia, and this is supplemented by six morphological papers on special districts or problems. G. Frongia provides a brief account of the climate for which the data are still somewhat meagre; M. Manfredi describes the results of a careful survey of about 26,000 springs, classified by flow, in connection with the projected economic regeneration of Sardinia; R. Sirchia gives records of flow in all the chief rivers. Vegetation is treated botanically by A. Béguinot, and from the forester's point of view by A. Pavari, while the nature and origin of the fauna are reviewed by B. Monterosso.

Papers relating to the inhabitants include brief sketches by A. Taramelli on their origins from the Neolithic Protosards through their descendants, the builders (as he believes) of the *nuraghi*, the distribution of which he treats in the second paper; a discussion by E. Migliorini of the relations of the Sardinian dialects to the modes of life, and one by G. Bottiglioni on the place of Corsican among Italian dialects. A. Mori provides an account of emigration of Sardinians to Italy, showing a slight decline from 25 per 1000 in 1871 to 22 in 1901 followed by a rise to 29 in 1921; in that year the largest numbers of emigrants were to be found in Liguria and Latium.

Several papers are devoted to historical geography, including one by A. Codazzi, who has searched the writings of Arab geographers for references to Corsica and Sardinia, and another by R. Bianchi d'Espinosa, who reviews the evolution of the map of Sardinia from Arab times onwards.

In conclusion, special attention is naturally devoted to the means adopted by the Government to improve conditions of life by engineering and other ways. E. Marino reviews the special nature of the Sardinian problem, differing as it does in many ways from that of Southern Italy, and notably in the much lower population density and in the absence of the *latifundia*. When legislation in favour of the island was adopted in 1897, and again in 1907, 260 of the 364 communes were without water systems, 156 without schools, and 199 without suitable cemeteries; and most of these defects have been left to the Fascist régime to supply, hence further decrees, and the finance resources made available during the last decade. There is the need on the one hand to eliminate stagnant water, to harness the torrents, and to reduce soil erosion, and on the other hand to use every possible drop of water for irrigation; but in view of the "excessive individualism of the Sards," the cooperative method of *Consorzi di bonifica* usually employed in Italy does not meet with immediate success. The large works are therefore organized in part directly by the state

and partly by the concessionaires. This paper is amplified by F. Passino, who gives a more detailed account of the "Integral Improvements," and by A. Rampazzi, who discusses the proposed construction of storage reservoirs on most of the rivers to supplement the great and valuable structures already in operation on the Tirso and Coghinas rivers. A. G. O.

ASIA

ARABS OF CENTRAL 'IRAQ: Their history, ethnology, and physical characters. By HENRY FIELD. Anthropology, Memoirs Vol. IV. *Chicago: Field Museum of Natural History*, 1935. 9½×12½ *inches; 474 pages; illustrations, maps, and figures*

This handsome monograph by Mr. Henry Field presents the first exhaustive anthropometric data concerning living Arabs of 'Iraq to be published, except for the smaller series of measurements (146) made by Dr. L. H. Dudley Buxton in 1926, for which, incidentally, Mr. Field, then serving his apprenticeship in the field, did the recording. Its appearance will be welcomed principally by his fellow physical anthropologists, to whom it is addressed both in form and substance. The appeal of the book however outranges its target, for 156 large plates of beautiful portraiture of Arab heads are a feature which has both an artistic attraction and an interest for any one who has visited 'Iraq and whose memory of facial types here finds pleasant refreshment.

Mr. Henry Field, Curator of Physical Anthropology at the Field Museum, Chicago, set off equipped with calipers, anthropometers, a specialized training, and the necessary enthusiasm and patience, to measure and record 667 individual Arabs during the winter of 1927–28 (Field Museum—Oxford University Joint Expedition to Kish). Three stature measurements, standing and sitting, and the whole complex of cranial and face measurements were made for every subject, besides numerous other observations that included hair texture and pigmentation, making in all something over 70,000 items of record: a labour as meritorious as it was vast, remembering the notorious aloofness of Mr. Field's subjects.

Statistical tables necessarily occupy the bulk of the book, and are clearly arranged and numbered. There follows an excellent analysis, in which graphs of comparative indices (9) are given for the three distinct groups into which Mr. Field's measured subjects fall: (*a*) Kish settled Arabs, (*b*) Ba'ij Badawin, and (*c*) 'Iraq soldiers. Sir Arthur Keith states, in his admirably lucid introduction, that these 'Iraq Arabs belong to "a highly differentiated race" with a "marked degree of variability," facts that are held to have important evolutionary significance. In a series of charts, the physical characters of one or other of the groups are plotted graphically side by side with those of a group from more or less related peoples—Egyptians, South Arabians, Somalis, Armenoids, Chitrals, and Pathans—and deductions are made. Mr. Field's view, based on archaeological as well as anthropological grounds, is that the Arabs of Central 'Iraq have predominantly the physical characters of the dolichocephalic proto-Mediterraneans, who, he postulates, inhabited the northern borderlands of Arabia in the earliest times, and who had spilled over into the Euphrates basin before the arrival upon the scenes of the ancient Sumerians.

The history of the tribes mentioned in the sub-title is not given in this volume, but what is of greater importance in an ethnological study of this kind is the modern research in which Mr. Field is taking so conspicuous a part. In 1934 Mr. Field set out again on a 17,000 miles expedition. He passed by way of Syria to 'Iraq, thence to Persia and northwards to the Caucasus, to make studies of some three thousand individuals. A future volume of Memoirs

of the Marshall Field Museum, in which these results are to be published, will be anticipated the more eagerly from the quality of his already notable contribution to our knowledge of the western Asiatic peoples. B. T.

THE STORY OF THE STŪPA. By A. H. LONGHURST. *Colombo: Ceylon Government Press*, 1936. 10×7½ *inches;* vi+54 *pages;* 43 *plates. Rs.*2 *or* 3*s.* [*London: Crown Agents.*]

In four chapters dealing with (1) the umbrella as a symbol of religious sovereignty, (2) the evolution of the *stūpa*, (3) Kerala architecture, and (4) Himalayan architecture, Mr. Longhurst traces the evolution of Indian temple architecture from the simple earthen tumulus to the fully developed temple tower, and shows how many of the best-known features of the latter owe their origin to the ceremonial use of the umbrella. His survey includes two widely separated areas, namely, the south-west coast of India between S. Kanara and Travancore (the ancient Kerala) and the outer valleys of the Himalayas in the north—regions of special interest in that they have preserved traces of indigenous culture which escaped submergence by those waves of invasion that swept from time to time over the less secluded parts of the continent. Hitherto the possible cultural and historic connections between these areas have not been sufficiently studied: some of their puzzling similarities are explained in this little volume. In the course of his story, moreover, the author traces the derivation of features in stone from wooden prototypes, and demonstrates the structural affinities of the timber architecture of the Himalayas with the typical Chinese pagoda. Mr. Longhurst, who is an archaeologist of wide Indian experience, has also a lively artistic sense, and he presents his suggestions in a fresh and attractive style, free from avoidable technicalities, that will afford pleasure as well as instruction to the general reader. The illustrations have been well selected and reproduced. C. E. A. W. O.

AFGHANISTAN: A brief survey. By JAMAL-UD-DIN AHMAD and MUHAMMAD ABDUL AZIZ. *London: Longmans, Green & Co.*, 1936. 10×7 *inches;* xx+160 *pages; illustrations and maps.* 15*s* (*library edition*), 12*s* 6*d* (*ordinary edition*)

Mr. Jamal-ud-Din Ahmad and Mr. Muhammad Abdul Aziz have succeeded in producing a very interesting book on Afghanistan. Their aim has been to give a short account of the geography and history of the country, and a brief survey of conditions there at the present time in such a way as to interest those who do not possess an extensive knowledge of the country. In their preface the authors state that they have endeavoured to "provide up-to-date and accurate information," and this they have done, although, as is inevitable, the book suffers a little by its brevity. The historical portion is of necessity so compressed that it is sometimes difficult for the reader to follow the complicated story unless he has already some knowledge of Afghan history. The geographical chapters tend to become little more than a catalogue of the principal mountains, rivers, and lakes, and do not quite succeed in conveying the fascination of a land of lofty mountains and many rivers.

When however the authors describe the condition of the country at the present time they do full justice to the developments which have taken place since the beginning of the late King Nadir Shah's reign; and to the constructive policy which is being pursued by the present Government to enable Afghanistan to take what is best in modern civilization without losing the sturdy independence of spirit and reverence for tradition which have been characteristic of her people in the past.

The book is illustrated by three maps and some very interesting photographs, and contains some useful and accurate information in its appendices. A. E. H.

HALF THE WORLD IS ISFAHAN. By CAROLINE SINGER and CYRUS LE ROY BALDRIDGE. *New York—London: Oxford University Press*, 1936. $12\frac{1}{2} \times 9\frac{1}{2}$ *inches; 154 pages; illustrations and route-map.* 21*s*

In Mr. C. L. Baldridge we have a worthy successor to the late Mr. Fred Richards, whose beautiful etchings of Iran in 'A Persian Journey' will be remembered by many. Mr. Baldridge is to be congratulated on his larger and more ambitious illustrations, as on his small marginal sketches, and he has certainly shown great skill in portraying the character of the people. Of the numerous monochromes, the feminine types (opposite p. 26) and the cross-roads in the Isfahan bazaar (opposite p. 100) stand out, but all are good.

The letter-press, by Miss Caroline Singer, though pleasantly written, suffers from the fact that much of it is already out of date. Iran is, and has been for several years, in a state of flux, so that much that was true when Miss Singer and Mr. Baldridge were there (apparently early in 1933) no longer holds good. The emancipation of women has made great strides since then, and progress has also been made in a number of other directions. These facts must be borne in mind when reading this book, and it must be regarded as an impression of Iran at a particular stage of her transition under the Pahlavi régime.

Inside the cover there is a map showing the route followed by Miss Singer and Mr. Baldridge. L. L.

LAND UTILIZATION AND RURAL ECONOMY IN KOREA. By HOON K. LEE. A report in the International Research Series of the Institute of Pacific Relations. *London: Humphrey Milford*, 1936. 9×6 *inches;* xii+302 *pages; diagrams and maps.* 17*s*

This volume, issued under the auspices of the Institute of Pacific Relations, treats of the land utilization of Korea in the fullest sense of the words, since it includes mineral and urban developments as well as farming. Dr. Lee, Professor of Agricultural Economics in Korea, has been inspired by the comprehensive parallel studies in the United States and has achieved his object by means of a team of workers in the field. In the first chapter he gives a general summary of the physical and economic conditions which underlie the land utilization. It is interesting to note that there are records of the amount of rainfall at Seoul for nearly five hundred years, although the period of continuous records only goes back for a third of that time. In the same way the records of population figures go back to A.D. 1404, and since then spasmodic returns have been made and preserved. From these figures it is seen that up to the eighteenth century there was a rapid increase of people, and in the early nineteenth century a decline, due to famine and pestilence, followed by an upward trend. There seems in this connection to be an inconsistency between the population figures given in Table 14 and those on p. 41. After a chapter on the characteristics of K ean agriculture, illustrated by many dot maps of crops, Dr. Lee proceeds to a detailed analysis of the factors that underlie land utilization, providing 132 Tables, which cover every aspect of the subject.

While this volume will become a standard reference on Korea, it is a pity that some of the illustrations are not more effective. A map showing the administrative areas used is a necessity, while the geological map, because of the symbols used, is unintelligible. In the same way the confused symbols on the map showing the location of the principal mines make it very difficult to distinguish some of the mineral workings. Dr. Lee is to be congratulated on producing, in a European language, one of the first standard works on Korea which is politically unbiased. A. C. O.

AFRICA

STONE AGE AFRICA: An outline of prehistory in Africa. (Monro Lectures, 1936.) By L. S. B. LEAKEY. *Oxford University Press*, 1936. $7\frac{1}{2} \times 5$ *inches;* xii+218 *pages; illustrations and map.* 7*s* 6*d*

The purpose of printing these lectures, which were given at Edinburgh University in February 1936, is to offer a general account of the Stone Age cultures of Africa as a whole to those who have not the time to digest the numerous specialist papers that deal for the most part with restricted regions. The author has produced a very useful little book, and one that is no mere compilation; Dr. Leakey writes always critically and often with first-hand knowledge.

In a short first chapter he writes, perhaps too briefly, of the "Climate and geography," especially the changes which they have undergone in human times, and the evidence for these changes. He then passes to the "Fauna of the Stone Age," discusses the animal remains associated with the various cultures, and tries to see what light they throw on early climatic changes and migrations. The next five chapters are devoted to descriptions of the Stone Age cultures, their succession, and some of the most important sites where remains have been found; two chapters being given to East Africa and one each to South Africa, North Africa, West, and Central Africa. Then follow two chapters on the "Stone Age art in Africa" and "Stone Age man in Africa."

The book concludes with a chapter on "The Stone Age in Africa compared with Europe." This, to the reviewer, is the most interesting part of the book. The resemblance between Still Bay tools of South Africa and Solutrean tools of Europe raises problems to which archaeologists appear to have given insufficient attention. Are these and other resemblances due to migrations of peoples, to the gradual spread of ideas, or to independent, parallel development? Questions such as these have for long presented most interesting problems which must be solved before the history of human migrations and cultures can be written. Dr. Leakey, thanks perhaps to his general training in anthropology, has realized the importance of these questions, and has tried to answer them. His answer is compounded of all three possibilities. While admitting the importance of diffusion, and recognizing the fact that peoples often make long journeys to new homes, he thinks that, within reasonable limits, similar circumstances may produce similar results. He believes that contacts between hand-axe and flake cultures have produced hybrid cultures, and that "the extraordinary similarity between some of the hybrid cultures in Europe and in Africa gives us one of our earliest examples of how cultural similarities can be developed independently from common ancestral forms, or, in other words, illustrates for us the processes of parallel evolution." Among other parallels that he is inclined to ascribe to independent development are the "S-twist" ovates of Europe and East Africa; the earliest European Aurignacian and the African Aurignacian in Kenya; the East African, South African, and the Rhodesian Still Bay cultures; the Solutrean, Aterian, and Still Bay cultures; and the rock paintings of Europe and South Africa.

The general picture which Dr. Leakey offers us has a complexity that carries an air of reality. Facts connected with the Stone Age are rapidly increasing, and their interpretation must depend very largely on the extent to which we are prepared to admit parallel evolution. The author has devoted one chapter to this subject; it is much to be desired that some one should go thoroughly into the whole question, including in their work a study of recent Stone Age cultures such as those of Australia and America. The task would involve much careful work, but it should result in a book that would deserve the gratitude

of all anthropologists. Dr. Leakey, with his knowledge of how stone tools are made and used, seems to be peculiarly qualified to undertake such a work.

R. U. S.

MORE ANNALS OF NATAL. With historical introductions and notes by A. F. HATTERSLEY. *London: Frederick Warne & Co.*, 1936. 9×5½ *inches; 256 pages; illustrations.* 10*s* 6*d*

Although Port Natal was discovered by Vasco da Gama on his first voyage to India on Christmas Day 1497 and was named in honour of the Day, no settlement or colonization was effected till the last century, though a Dutch attempt was made in 1721. In 1823 Lieut. Farewell's party settled on the coast, and in 1837 the Dutch crossed over the mountains from what is now the Orange Free State and founded Pietermaritzburg. They endeavoured to form an independent republic, but were driven back over the Berg in 1842 by the British troops. Natal was proclaimed a British possession in the following year and Durban named after the Governor of the Cape, Sir Benjamin D'Urban. Some years ago Mr. John Bird was commissioned by the Natal Government to collect material for the early history of the colony. He obtained a large amount of information from official sources and from diaries and manuscripts in the possession of many who had been eye-witnesses of the stirring events of the early settlement. The work was completed and finally published in 1888 at Maritzburg. It concluded with the landing at Durban in 1845 of Natal's first British Lieutenant-Governor, Martin West. Christopher John Bird, a son of the previous John Bird, who was an important official in the Natal Government, collected a considerable amount of material bearing on the history of the Colony since 1845. His inquiries produced a large crop of personal reminiscences, and much additional matter was derived from official sources and other publications. As he died in 1922 before anything was published, it has been left to Mr. Hattersley, Professor of History at the Natal University College, to complete the work and issue the present volume.

Many of the early emigrants came out to Natal under the Byrne scheme, which, though it has many shortcomings, seems to have brought out a number of successful colonists, whose descendants are still in the Colony. In the present volume there are several narratives of their adventures on their way out in sailing ships and their journeys up country to locate the farms assigned to them. Other excerpts tell of Sir Theophilus Shepstone and his native policy, the impressions of Bishop Colenso when landing at Durban and his first visit to Maritzburg, and also the early reminiscences of many other less distinguished settlers. The volume, though not dealing with any geographical problems, will be of special interest to all those who are interested in the life of their predecessors and pioneers.

W. L. S.

AUSTRALASIA AND PACIFIC

WALKABOUT: A journey in lands between the Pacific and Indian Oceans. By LORD MOYNE; with an introduction by A. C. HADDON and an appendix by A. J. E. CAVE. Illustrated from photographs by LADY BROUGHTON. *London: William Heinemann*, 1936. 9×5½ *inches;* xxvi+366 *pages; illustrations and route-map.* 18*s*

The author and his friends set out in a motor-yacht to visit New Guinea and the East Indies, and to bring back specimens of the material culture of the natives before it is too late. Some of the objects which they secured were previously represented only in German and Dutch Museums, while others were altogether

new. Skulls were also brought back from New Guinea, and some of them are particularly interesting as showing strongly developed Australoid characters. Dr. A. J. E. Cave devotes an excellent appendix to the results of the expedition from the standpoint of physical anthropology, and the serious reader who has no special knowledge of this subject would do well to read the first part of this before beginning Lord Moyne's story. One may perhaps be allowed to express surprise that Dr. Cave classifies the extinct Tasmanians as Australoids without comment. Lord Moyne finds a particular interest in pygmies and went to great trouble to discover little people throughout his journeyings. His investigation of the Aiome pygmies of the upper Ramu River in New Guinea is particularly noteworthy. It seems that no member of the expedition was a trained scientist, but results were obtained none the less. The splendid photography by Lady Broughton deserves special mention and one regrets that no indication is given of her equipment or methods. Two particularly fine photographs are those of the Aiome Mountains at sunset and of fishing-boats near Tourane (Indo-China). The book is well produced but there are some misprints, including a serious one on p. 251. A major botanical error occurs on p. 230. Lord Moyne writes in an attractively simple style, and exciting incidents are related with none of the exaggeration that makes many travel books so tiresome. J. R. B.

POLAR REGIONS

ICY HELL: Experiences of a news-reel cameraman in the Aleutian Islands, Eastern Siberia and the Arctic fringe of Alaska. By WILL E. HUDSON. *London: Constable & Co.*, 1937. 8×5 *inches;* xii+308 *pages; illustrations and map.* 10*s*

This book is written by a "news-reel cameraman" and describes in picturesque and pithy language an adventurous journey through a little-known part of the Arctic. Crossing the Aleutian Chain to Petropavlovsk, he and his companions, in a small schooner commanded by Captain Louis Lane, voyaged through the Bering Strait, touching at Siberia and Point Barrow in Alaska. Thence they set out along the northern fringe of Alaska, through the Beaufort Sea, for Herschel Island (spelt Herschell throughout), but were frozen in near Demarcation Point. Abandoning the schooner, he and some of his companions, including Captain Lane, travelled by dog-team through the Endicotts to Fort Yukon and civilization. If Mr. Hudson's news-reel was as racy as his narrative it must have delighted the audience. Though it is not perhaps intended for scientific readers, it is a pity that Mr. Hudson has left the journey undated: from internal evidence it must have taken place at least eight or nine years ago. Certain parts of it are therefore not to be taken as applicable to present-day conditions. This applies notably to the Aleutian Islands, Atka and Attu, at which the vessel touched, and to the Kenai Peninsula, where the author saw "nothing but poverty and misery." Attu is described as "the loneliest spot outside of purgatory." This description is no longer true, as Attu is now in touch by radio with the rest of the world; its native inhabitants themselves, as well as the U.S. Coast Guard (which paid it three visits in 1936), regard it because of its very remoteness as a kind of ocean Paradise. An archaeologist who spent three weeks on it last summer stated that the native inhabitants lacked for nothing in the way of winter provision. Mr. Hudson's visit to Unalaska was paid in the days of prohibition, so that unfortunately his statement that "the gin-trader there is conspicuous by his absence" is no longer applicable.

As regards the major portion of the narrative concerning the fringes of the

Beaufort Sea, the Alaskan natives there own herds of reindeer, and are now fairly safe from starvation on this account. His description of this little-known territory is informative and interesting, and despite hardship and trials of endurance, his good humour is unflagging. I. W. H.

ECONOMIC AND HISTORICAL GEOGRAPHY

FORTUNE MY FOE: The story of Charles John Andersson, African explorer (1827–1867). By J. P. R. WALLIS. *London: Jonathan Cape*, 1936. 8×5½ *inches; 412 pages; illustrations and sketch-map.* 10*s* 6*d*

This book is not merely a record of travel and exploration. It is in form a biography of Charles Andersson; and because Andersson's interests and activities were many and varied, it becomes also something not unlike a history of South-West Africa for the short period of his active life. With the exception of short intervals, when he seemed to himself to be marking time, Andersson conscientiously kept a diary, and his diaries have now for the first time been used by Professor Wallis, and are the mine from which he has drawn the greater part of his material.

Andersson's father had settled in Sweden and married there, and his son took his mother's name. In 1849 he left home at the age of twenty-two, and soon after reaching England was introduced to Galton, who was then planning the journey which eventually took him to Ovamboland, and welcomed so promising a lieutenant. They came to Otjimbingue in 1850, and the expedition north was made in the following year. Finding that local conditions made it impossible to reach Lake Ngami, they had to content themselves with reaching Qvamboland. Thence they turned back, and with Galton's return to England Andersson's independent career began.

As he was a contemporary of and not unnaturally compared with Livingstone, it is only fair to Andersson to notice that from the first he suffered under a severe handicap from which Livingstone was free. He had no private means, and no backing, and therefore had to trade for a livelihood. Apart from the time expended in commercial ventures, trade in a wild country had its moral and political dangers, which Livingstone was able to avoid. Andersson kept his hands clean, tried his best to remain neutral between the hostile tribes, but was eventually forced to decide that this was impossible. He sold his belongings in Damaraland for cattle, which he drove overland to the Cape, and with the proceeds of this venture financed his journey to Lake Ngami. This he reached by a new route, direct across country from Walvis Bay: hitherto such traders as had reached the lake had followed Livingstone's track east of the Kalahari. Andersson then came to England, where he read a paper on his journey before the Royal Geographical Society, and was awarded a case of surveying instruments. His book on Lake Ngami was published in 1856 and was well received; but the issue of Livingstone's 'Missionary travels' in the following year took the wind out of its sails.

Back in South Africa he turned to the new industry of copper mining for a living, but in 1858 started on another journey, planning to reach the Kunene River. After a most arduous passage through the Kaoko veld, he was forced to turn back by lack of water. Later he went north, and though he did not reach the Kunene, he did reach the Okavango, which from native reports had long been to him the "mysterious river." Then he married, and turned trader on a large scale. He suffered from the persistent attempts of the Zulus to close the vital cattle route to the Cape, as well as from the general unrest which was ruining trade. In this crisis he accepted an offer of their chieftainship made to

him by the Damaras, in the hope that he would enable them to defeat their old enemies and oppressors the Namaquas and bring peace to the land. In the first attack made on the Hottentots, Andersson had his leg so badly broken that he was a cripple for the rest of his life. During the whole of his residence in Damaraland, Andersson had industriously collected birds, and had long projected a *magnum opus*, fully illustrated in colour, of 'The Birds of Damaraland.' During his convalescence he turned again to his bird book. It was not completed in his lifetime, but was issued by another hand after his death as a mere ghost of what he had proposed; and his great collection of specimens was dispersed.

In 1866 he persuaded a chief to grant him 400 square miles of country in northern Damaraland. He had elephant hunters out to the north, and decided to travel to meet them. Having done so he went on. In Ovamboland he and his whole party suffered severely from fever and dysentery, but he struggled on, and barely reached the Kunene, on which his heart had long been set. He was turned back from its banks in a dying state and survived very few days of the journey homewards.

Andersson bore his many hardships and disappointments with a high courage and exemplary devotion. "Fortune my Foe" was a phrase perhaps unknown to him, but, even when we remember his occasional wrong decisions on important matters, no one will deny that Professor Wallis has chosen an appropriate title for what is a tragic book. L. G. C. L.

THE PRINCIPLES OF ECONOMIC GEOGRAPHY. By R. N. RUDMOSE BROWN. *London: Sir Isaac Pitman & Sons*, 1936 [1937]. (Third Edition.) $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xvi+208 *pages.* 6*s*

Text-books on economic geography appear to fall into two categories: those that deal with the subject regionally and those that deal with it by topics. This book, as befits one dealing with the principles of the subject, falls into the second category. It gives a comprehensive survey of the scope of economic geography, embodying much historical material which will be useful to those readers who have not a historical background. Indeed the scope of the book is wider than is often found in text-books of this nature. Professor Rudmose Brown does not hesitate to deal with such controversial subjects as native labour in the tropics, colonization, "White Australia," etc. Special attention is paid to transport and communications, which occupy six chapters.

The danger of such wide surveys in a comparatively small space is to be found in excessive generalization, over-simplification, and a conciseness which sometimes sacrifices clarity. Thus the reference to coal rationing in 1917 as "a clumsy failure to realize the real climatic divisions of the country" may not be very intelligible to a post-war generation. Nor is the meaning of the statement that "water power was utilized at an early date in Great Britain for working looms quite clear." If it means early in comparison with other countries it is true, but if it means early in comparison with its use in other industries, for example corn-milling, it is hardly correct. Again, it would be interesting to know what is the evidence for the assertion that people read lighter literature in summer than in winter, and that this may be due to climatic differences.

Though this is a revised edition of an earlier work, one or two points seem to have escaped revision. The statement that the import of tea to the United States "shows much increase, and will no doubt grow rapidly as a result of alcoholic prohibition," reads strangely now. Again some of the statements based on production statistics appear to need modification in view of the latest figures. It is hardly correct to say that "the United States . . . produce most

of the world's supply of lead." This was true until about 1931, but not since then: in 1933 for example the American production was 468,100 metric tons out of a world production of 1,152,400 metric tons ('Statistisches Jahrbuch,' 1935, p. 72). The same criticism would appear to apply to the statement on Malayan tin production. Finally the figure given for the world output of wool in 1932 is a thousand times too great. It was not "over 1600 million tons," but 1,695,000 metric tons (*ibid.*, p. 81). T. S. W.

RAW MATERIALS OR WAR MATERIALS? By ALFRED PLUMMER. *London: Victor Gollancz*, 1937. 7½×5 *inches;* 144 *pages.* 3*s* 6*d*

"The world is so full of a number of things" that the ingenuity of mankind is directed almost as much to limiting production as to securing distribution. That is particularly true of raw materials, which form the topic of the first part of this book. Dr. Plummer shows that only a limited number of such raw materials (palm oil, rubber, tin, copra, and phosphates) come from colonial territories, and a still more limited number from those mandated territories which might presumably be available for redistribution to the dissatisfied Powers. A survey of the more important raw materials shows that the efforts to limit their production have been largely unsuccessful, and that access to them has not been denied, except in cases of a deliberate policy of self-sufficiency. The only exceptions to this are "the discriminatory export duties on tin ore from the Malay States and Nigeria, and the supply and price of tin under the International Tin Cartel." Thus in peace time nations with the will and the money can buy raw materials from areas not under their political control. In war time this might not be so, and that is perhaps an important aspect of the demand for colonies.

Such a consideration leads Dr. Plummer, in the second part of his book, to review the "war-mindedness" of the dissatisfied Powers and to conclude that present problems can only be solved by linking together the collective security system, disarmament, and the redistribution of colonial territories. T. S. W.

AN ATLAS OF EMPIRE. By J. F. HORRABIN. *London: Victor Gollancz*, 1937. 7½×5 *inches;* 160 *pages; sketch-maps.* 3*s* 6*d*

This book, which is a successor to the author's well-known 'Atlas of current affairs' and 'Atlas of European history,' aims "at providing a compact illustrated catalogue of those areas of the world's surface which are the property, not of their own inhabitants (or class of those inhabitants), but of some other alien State." Thus the maps range from the Dodecanese Islands to Australia. There are seventy simplified line maps, each with a paragraph or two of text. These show not only the present imperial position of the Powers, but also how that position was attained. Thus the maps of Africa include "Africa before the Great Scramble," "Chartered Companies in Africa," as well as those indicating the present state of African possessions. The maps are clear and well drawn with the exception perhaps of Map 33, which has a blurred effect. In one or two cases the information is a little vague. For example the criterion for the "High Mountains" of Map 17 and the "Settled Areas" of Map 63 is not clear. On the other hand two valuable features are included. Many of the maps have insets, showing, on the same scale as the main map, the "mother country," which reveal at a glance the disproportion between the size of the European states and their colonial possessions. Similarly, diagrams of population show the quantitative relation between native and non-native population, as well as between colonial or dominion and European population.

The text is necessarily a brief survey of area, population, date of acquisition,

chief products, etc. On two occasions details are given which appear somewhat irrelevant to their context. Native labour in the gold mines of Kenya may get ½*d.* an hour, and some important coal fields in Bengal, Bihar and Orissa earn "100 and 120 per cent. dividends on wages of 8*d.* a day," but such statements in isolation are apt to be misleading. These however are minor points in a work which will be useful to all interested in problems of imperialism.

T. S. W.

GENERAL

BRITANNIA. By T. CRISTUREANU. [In Romanian.] *București: "Adeverul,"* 1937. 7½×5 *inches; 192 pages; illustrations and maps. Lei* 50

This book is a survey of the British Empire as seen through Romanian eyes. Mr. Cristureanu is a keen observer and a sincere admirer of the British Empire as a political organization. He asks if the British Empire is breaking up, and answers that, in the sense of a union of subject peoples, it is dead, while as a Commonwealth of Nations, it is alive. He examines the various pieces of which the Empire is composed, including Egypt, Ireland, and India. With regard to these three countries, he points out that however much they may desire independence from England, they would never endure the domination of any other Western or Eastern Power. He investigates the structure of the Empire in its ethnic, religious and social aspects, and estimates its economic, financial, and cultural powers. In international affairs Mr. Cristureanu thinks that Great Britain has striven to maintain friendly relations, but would fight to the death against any other imperialistic domination. Lastly, to the question of the future he answers: The British Empire, guided by the three principles of life—self-government, self-support, and self-defence—constitutes a new and living organism in the sense of a practical beginning towards an international world state.

L. P.

ROUND THE WORLD WITHOUT WORRIES. By THORNTON CLARKE. *London: Heath Cranton,* 1937. 9×5½ *inches; 232 pages; illustrations. 7s 6d*

The author disarms criticism by defining his book as the diary of a scamper round the world. The scamper is a luxury one, and the book, after the manner of diaries, is uneven. The author is always making a mental note to revisit a city or scene, when there will be more time to see things; but the ship is always about to sail, until, after five months of intensive sightseeing, he reaches London again.

In Madeira, the first call after leaving New York, the baksheesh bandits make their first appearance. Thereafter the tour proceeds to Palestine and Egypt, eastwards to Ceylon, the Straits, Siam, China, and Japan, through the Pacific, with many calls, to San Francisco, Panama, Havana, and home to New York. The book is packed with interesting bits and pieces of information, terse descriptions of local customs, scraps of folklore: the impressions or recollections of an alert mind. There is unfortunately no route-map. A personal diary might well have been illustrated by the author's own photographs.

J. P. H. M.

THE MONTHLY RECORD

MEDALS AND AWARDS 1937

His Majesty the King has approved the award of the Royal Medals as follows: the *Founder's Medal* to Colonel C. G. Lewis, for his surveys on the Miri Mission, 1911–12, in 'Iraq and Syria, 1918–19, and on the Afghan and Turco-'Iraq Boundary Commissions; for the air survey of the Irrawaddy Delta, 1924; and for his promotion and encouragement of the exploration and survey of the Himalaya; the *Patron's Medal* to Mr. Lincoln Ellsworth, for his work in developing the technique of aerial navigation in the Polar regions, culminating in his successful flight across the Antarctic in 1935–36. The Council have awarded the *Murchison Grant* to Mr. Ronald Kaulback, for his surveys in South-Eastern Tibet; the *Back Grant* to Mr. L. R. Wager, for his work in mountain physiography; the *Cuthbert Peek Grant* to Mr. V. E. Fuchs, to assist him in his expedition to Lake Rukwa, East Africa; the *Gill Memorial* to Mr. George B. Barbour, for his work on the geology and geography of China.

ORIGIN OF THE GREAT LAKES BASINS OF NORTH AMERICA

In the *Journal of Geology* (vol. 45, no. 1, 1937) Mr. F. P. Shepard discusses the "Origin of the Great Lakes basins," reviving the neglected glacial hypothesis. After considering the objections of those who doubt the power of ice in continental glaciers to erode deep basins, he proceeds to show why it seems likely that among several contributing factors in the production of the Great Lakes erosion is the most important.

Four main types of evidence are reviewed. In the first place it is pointed out that basins comparable in dimensions with those of the Great Lakes exist all round the Canadian shield, as in north-west Canada and beneath the sea in Hudson Bay and the Gulf of St. Lawrence, which contains large, deep, rimmed depressions. A lowering of sea-level would, in fact, leave similar lake basins in the gulfs and bays. This of course is a heavily glaciated region, and similar lake basins and submarine basins occur in the glaciated region of Northern Europe. Secondly it is unlikely that in either of these areas, where crustal stability has long been developed, diastrophism has been active in shaping the basins. In other areas, on the contrary, outside the limits of the Pleistocene glaciation where there are basins as in the western United States, Central Asia, and notably the African Rift Valley, faults and scarps abound and earthquakes are common.

Thirdly it is shown that complete gradation exists between fiords, conceded to be largely due to glacial erosion, and submarine troughs out on the open continental shelves off glaciated coasts; also between the Great Lakes and the Swiss mountain lakes which are certainly glacial excavations. Fourthly, one of the most convincing arguments for the glacial excavation of the Great Lakes is the enormous quantity of glacial drift found south of the basins. The nature of the drift suggests derivation from adjacent lake basins as for example the clayey till of Illinois which appears to be derived from the shales of the Lake Michigan basin. The freshness of much of the drift indicates that the glaciers were digging into solid rock rather than just removing the mantle rock from old weathered surfaces.

The author concludes with the suggestion that if it is true that the Great Lakes, the various other large basins in glaciated territory, and the deep arms of the ocean along glaciated coasts, are all largely the product of glacial erosion,

the glaciers may have been much thicker than is commonly supposed. An average thickness of 4 miles for the continental ice masses might suffice to lower the sea-level sufficiently for the cutting of submarine canyons. With ice of great thickness the cutting of large basins would be greatly intensified.

DATING VOLCANIC EXPLOSIONS BY TREE RINGS IN LASSEN PARK, CALIFORNIA

In a paper entitled "A tree ring calendar for dating volcanic events at Cinder Cone, Lassen National Park, California," published in the *American Journal of Science*, for February 1937, Mr. R. H. Finch describes the tracing of two great explosions of volcanic ash back to the years 1567 and 1666. Near the base of Cinder Cone there are many curious depressions in volcanic ash that mark the location of trees killed by the ash fall. Excavation of those depressions reveals stumps of pine trees rooted in the old soil beneath the ash. As the wood decays the ash rolls in to take its place, so that the depressions are more or less self-perpetuating. It occurred to the author in 1928 to try to fit the ring pattern of some of the stumps of trees killed by ash or lava to the pattern obtained from one of the oldest living trees in the vicinity. The tree selected for study was a yellow pine 60 inches in diameter situated a quarter of a mile west of Cinder Cone, growing in ash 20 to 30 inches deep. It appeared that the first ring, at a height of 30 inches above the ground, was formed in 1485. Apparently the trees did not survive if the ash deposit amounted to much over 30 inches. Not far away there is another generation of trees with their root systems definitely in the ash layer, some of which are at least 250 years old. Thus the explosion depositing this ash must have occurred before 1680 and after 1485.

One part of the ash bed is covered by a lava flow which in turn is covered by a second ash layer from a later explosion. The chemical character of this ash indicates that the lava was still hot at the time it was mantled, the eruption just preceding the explosion. The ash over the lava is highly oxidized through steam furnished by precipitation, but is practically unaltered elsewhere.

Reference to the tree-ring calendar, which is diagrammatically shown in the paper, indicates marked diminutions in the growth of the tree selected for study for a few years beginning with 1567 and 1666. Since the first ash fall, the greater of the two, is known from the determinable ages of the trees in the vicinity to have occurred between 1485 and 1680, the strong indication is that it occurred in 1567, the year when the tree shows sudden injury; and it is reasonable to suppose that 1666 was the date of the later ash explosion and associated lava flow. It may be added that the last eruption of lava from Cinder Cone took place in the winter of 1850–1.

A WOUTNEEL MAP OF 1602

We have received from Mr. E. G. Box, whose studies of early English maps and road-books have from time to time been noticed in the *Journal*, an enlarged reproduction of a small world-map, enclosed within a circular border, which has come into his hands and does not appear to have been previously known to modern students. Dated 1602, it was found inserted in a copy of a much later work—the 1657 issue of the traveller's guide, bearing the title 'A book of the Names of all Parishes . . .' From the publisher's signature, H.W., there can be little doubt that it was a venture of Hans Woutneel, a Fleming settled in London, whose map-making activities have only lately begun to attract attention. It bears the signature in full of the noted engraver William Kip, as does also the small circular map of England and Wales found in some copies of 'A direction for the English Traviller,' of 1636, which map was likewise published by H.W.

Woutneel's most ambitious production in this line was his fairly large map of England and Wales (see *Geogr. J.* 82 (1933) 536–8), but this was not much more than an enlarged version of the map of 1594, included in the Royal Geographical Society's reproductions of early county maps. The small world-map is likewise only a copy of an earlier and equally rare map brought out by Hondius in 1589, which was reproduced in the 'Remarkable Maps' published by F. Muller and Co. The map proper is on the pseudo-heart-shaped projection first used by Waldseemüller in 1507, and its substance shows a close relationship with a much larger map by Hondius first published about the same date (1589). The small map has the Hebrew characters standing for Jehovah at the top of the circle and various Bible texts round or within the border, whence it has been thought possible that it was made for insertion in a Bible. But a similar pious strain is to be noted in other contemporary maps, including the "Christian Knight" map also by Hondius.

Although Woutneel's copy is of no intrinsic importance it is an interesting indication that there may be yet something more to be learnt about English map production in the early seventeenth century. It may be mentioned that the map is printed on paper with a watermark otherwise in use a good deal later—for instance in one copy at least of 'A Direction' of 1636. The plate may have passed into the hands of the publisher of that work, Matthew Simons, and the map have been re-issued by him. If so, it might lend support to the suggestion already made (*Geogr. J.* 83 (1934) 172) that Woutneel may have brought out an earlier edition of the 'Direction' than any now known (there are independent grounds for postulating such an earlier issue), for if the world-map had such a history it would be only natural that the "thumb-nail" maps in the 'Direction' should have shared its fate.

The world-map above described was reproduced (by an accident it seems) in a short article by Mr. Box describing Norden's scarce map of Hampshire, of which he had acquired a copy, in the *Proceedings* of the Hampshire Field Club and Archaeological Society, vol. 13, part 2. The article has another interest since it calls attention to the fact, which seems to have escaped notice, that one of the coats of arms shown on the map is that of William Sanderson, the well-known patron of geography and voyages, which are also to be seen on the famous Molyneux globes (of 1592) made at his expense. We do not know that Sanderson had any personal connection with Hampshire, and it seems possible that he was one of the various patrons, among men of note, from whom Norden received a certain amount of support in his undertaking, as suggested by the dedications prefixed to many of his works. Mr. Box's copy of the map, like that in the British Museum, bears the name of John Overton and is therefore somewhat later than the Society's copy reproduced in its set of Early County Maps, 1932. The original issue of about 1595 has not been traced so far.

THE BRITISH HEALTH RESORTS ASSOCIATION'S HANDBOOK

A copy has been received of the fifth and enlarged edition (1937) of the Handbook of the British Health Resorts Association which, sponsored by the medical profession under the presidency of Lord Meston, was founded in 1931 with the object of promoting more appreciation of the advantages of the home resorts. The Handbook is edited by Dr. R. Fortescue Fox assisted by a committee of medical men which includes two meteorologists representing the Meteorological Office and the Royal Meteorological Society.

The various seaside and inland resorts and spas are described under appropriate regional divisions, and much information is given on topography, climate,

soil, water, scenery, and general amenities likely to be serviceable to those seeking change, rest, or convalescence.

The scope of the book is not entirely confined to the British Isles: a concluding section deals with resorts in the Dominions and Colonies. There is a foreword by the Minister of Health, setting forth the aims of the Association, and an introductory article by Mr. L. C. W. Bonacina on climate which points out that though the influence of climate on health was emphasized by Hippocrates, sure knowledge even to-day is difficult to obtain on account of the immense complexity of the reactions. The article draws attention to certain advantages of the climate of the British Isles commonly overlooked, and to the high therapeutic value of the country, moorland, and sea air of these islands.

OBITUARY

ARTHUR WINSTON MOORE

A. W. Moore, who died on April 8, at Zermatt, was educated at Sutton Valence and Keble College, Oxford. In his second year as an undergraduate he took part in the 1932 Oxford University Expedition to Sarawak. In addition to his work as assistant entomologist, he carried out an interesting journey into the little-known country at the head of the Tinjar and succeeded in completing the first ascent of the twin-peaked mountain Kalulong.

At the conclusion of this expedition, he returned to Oxford, where he took a degree in forestry. To one of his adventurous spirit a further journey into unexplored country was almost a necessity, and he sailed with the Oxford University Expedition to Ellesmere Land. On this expedition he served in the capacity of biologist and photographer; and he was chosen with Sergeant Stallworthy, Royal Canadian Mounted Police, to take part in the journey to Grant Land. After 300 miles of hard travel, mainly over Polar pack-ice, the party finally reached Lake Hazen in Grant Land. From there, Moore pushed on with one Eskimo through the United States Range up on to the unknown ice-cap of Grant Land. At last, with tired and hungry dogs, he reached the summit of a high mountain in approximately latitude 82° 25′, which he christened "Mount Oxford." He was then in sight of a new range of mountains whose peaks reached a height of 10,000 feet.

In 1936 Moore was given a Government appointment in West Africa, as a result of which he returned to Oxford for a further course of forestry studies. During the Easter Vacation he went to Switzerland for a fortnight's ski-ing, and it was at this time he caught the chill which led to his death at the early age of twenty-seven.

He was a very keen Territorial; but there is no doubt that exploration was his real profession, for his determination carried him through to the success about which he was always particularly modest—a modesty which sometimes tended to keep him in the background; but those who knew him well will feel that the world has lost a brave and lovable character. E. A. A. S.

MEETINGS: SESSION 1936–37

Thirteenth Evening Meeting, 3 May 1937. The President in the Chair

Elections: Mrs. Alice C. Bischoff; Daniel Ahmling Chapman, B.A.; Henry Paul Eitzen (2/Lieut. South African Artillery); Captain J. Ward Hughes; Lieut. Kenneth Sydney Powell Jones (South African Air Force); Evan Jones, B.A.; Alan George McLaren; Michael Vaughan Mather; Tomás Pacanins; F. L. Pantin; Chykra Salhab; Mrs. Peggy Winifred Scott; Su Ting, B.SC.; Major-General R. C. Wilson, C.B., D.S.O., M.C.

Paper: Plant-hunting in the Aleutian and Pribilof Islands. By Miss Isobel Hutchison

Eighth Afternoon Meeting, 10 May 1937. The President in the Chair

Paper: Medical and Physiological Aspects of the Mount Everest Expeditions. By Dr. C. B. Warren

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